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ABSTRACT

"Clearing" magazine is a bi-monthly environmental education resource and activity guide for K-12 teachers in the Pacific Northwest. Each of these four volumes is a compilation of outstanding articles and activities from past issues of "Clearing." Volume I (Issues 1-20) presents 47 articles organized into four sections: "Spring," "Summer," "Autumn," and "Winter." Topics covered in the articles include bird watching, origami, investigating environmental issues, Native Americans, and recycling. Volume II (Issues 21-40) presents 37 articles and activities on topics such as: global awareness, dunes, El Nino, wetlands, and Earth magic--listening to the Earth. Volume III (Issues 41-60) presents 47 articles and activities on topics such as: exemplary programs in environmental education, tropical rainforests, biological diversity, hazardous waste, plastics in the marine environment, and oil spills. Volume IV (Issues 61-80) contains 75 articles and activities that cover topics such as: plastic recycling, Native American oral traditions in environmental education, ozone trends, dwindling northwest salmon, garbage, Chief Seattle, and computer-aided environmental education.

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THE BEST OF CLEARING

environmental education in the pacific northwest

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

Volume I: Issues 1-20

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A collection of ideas, activities, and resources for teaching about our environment

THE

BEST OF

CLEARING

environmental education in the pacific northwest

*A compilation of outstanding articles and activities
from past issues of Clearing*

Volume I: Issues 1-20

**Compiled by the Environmental Education Project
19600 S. Molalla Avenue
Oregon City, OR 97045**

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The Environmental Education Project is a non-profit educational resource center and clearinghouse serving the Pacific Northwest. The Project maintains an extensive resource collection, sponsors workshops and conferences, and acts as a clearinghouse of environmental education curriculum materials.

Clearing: Environmental Education in the Pacific Northwest (formerly subtitled *Creative Resources in Environmental Education* and *Nature and Learning in the Pacific Northwest*) is produced bi-monthly by the Environmental Education Project, and is a guide to current events, resources, ideas and activities in the field of environmental education, focusing on the pacific Northwest region.

INTRODUCTION

We were an unlikely couple. She a puppeteer from the Bay area and I, an engineer-turned-educational networker. The child we conceived was even less likely. A kind of resource guide, how-to, newsletter, communication tool, access guide and journal, all in one. Still, many great stories have awkward beginnings.

It is hard to know when something really begins. Whether the idea had been floating around for awhile waiting for someone to think it, or whether the idea itself was created out of the unique blend of circumstances. Now I see that it doesn't matter. What matters is how the people around it respond to the idea. How they responded to this idea of a new magazine in 1978 is the story of Clearing.

One of the saving graces of Clearing*'s early years was the fact that we knew very little about what it took to publish a magazine. But we were enthusiastic and willing to do what we had to do to make it work. That, more than anything, has allowed* Clearing *to continue. The dedication and commitment of its staff to keeping it going have been strong. And this commitment has been fired by the readers who use* Clearing *and those who thought it was worthwhile and useful.*

Clearing *has always had a life of its own, growing its own style and process, and asking of its staff a great deal. When I think now about this issue of* "The Best of Clearing," *I am pleased that in the process of doing the magazine, a body of information has been collected which will continue to help educators and their children learn about the world around them. The real best of* Clearing, *though, is something which goes beyond words. It is the late nights of production, the sweat and tears of getting each issue out, the digging deeper into ourselves to find that which can give a greater meaning to what we have written, and the cooperation and support from so many people over the years. That best of* Clearing *is written more in our hearts, and is for me what will be carried long after the pages of newsprint have faded, the binding has disintegrated, and what was written has been forgotten.*

I am thankful for having been a part of Clearing, *to have helped where I could, and through that, to have worked with so many kindred spirits. And every time a new issue comes to my door, I shout a small hurray that this unlikely child, this newsletter, this process, continues to live and grow.*

—Michael Soule
Quadra Island, British Columbia
1985

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SPRING

a season of birth

Waxwings

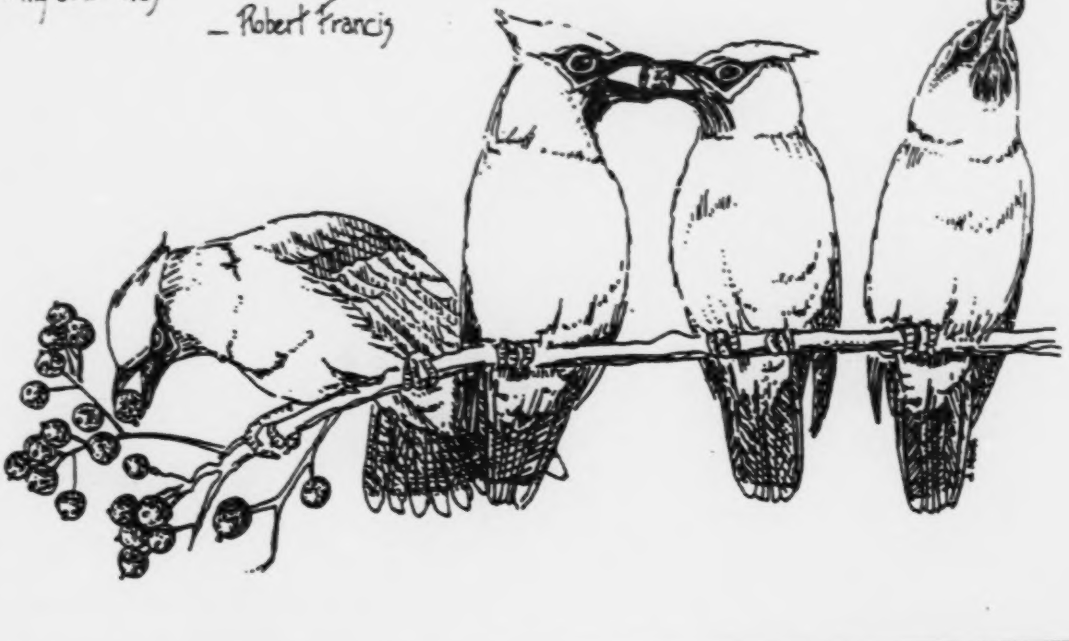
Four Tao philosophers as cedar waxwings
Chat on a February berry bush
In sun, and I am one.

Such merriment and such sobriety—
The small wild fruit on the stalk—
Was this not always my true style?

Above an elegance of snow, beneath
A silk-blue sky a brotherhood of four
Birds. Can you mistake us?

To sun, to feast, and to converse
And all together—for this I have abandoned
All my other lives.

— Robert Francis



From issue #18, Spring 1981. Art by Jan Muir.

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Spring

The earth awakens, birds return north, ground softens, wildflowers blossom, air warms, days lengthen, bulbs push up, goats kid, sheep lamb, sap runs. So much begins to happen in spring that it is difficult to track it all. So much unfolding in the world around us, and equally as much unfolding from within each of us. Spring is certainly the birth of the new year, but like all new life, it is only the emergence of the pattern of the year. A year is conceived in the fall of the year before and has its birth so closely related with the death of the last year it is hard to tell the two apart. We see they are one in the same, flowing into each other.

But in contrast to the stillness of winter, spring brings us a sense of movement. We can almost feel the daylight moving a minute or two into the morning and evening each day, we can feel the earth beginning to move under our feet as it awakens, and we can feel the warm winds moving gently up from the south. But we realize this is not just a random pattern of movement. In each of the movements we can feel, there is a definite sense of pattern, of moving from somewhere and to somewhere. We can really sense being on a voyage and knowing that when it is over, although we may still be in the same place, we will have moved somehow. We will know something more, we will have experienced something more, we will have grown.

T. S. Eliot shares

> "the purpose of life is exploration
> the journey of our exploring
> shall bring us back to where we started
> so we may know that place for the first time."

And so it is with spring. It is brand new and it is a million years old. We are brand new and we are hundreds of years old. So as we enter spring we need to work at being in touch with both our newness and our wisdom from the ages. We need to use all that we have been given as experience, as wisdom, as tools, and then take that one extra step into exploring spring as we have never done before. We need to take that one step that will lead us forward into and through the patterns of the new year. Only then can we begin to know that we are living up to our potential.

As educators, it is important for us to remember this, and to do all that we can to help our students take that extra step that is the adventure in life, the extra step that will help them reach a new level of understanding the world around them and themselves. Like most good things, this involves taking a risk beyond what we have to. But by taking that risk we have the opportunity to step beyond ourselves, to grow.

Mountain
Oregon grape

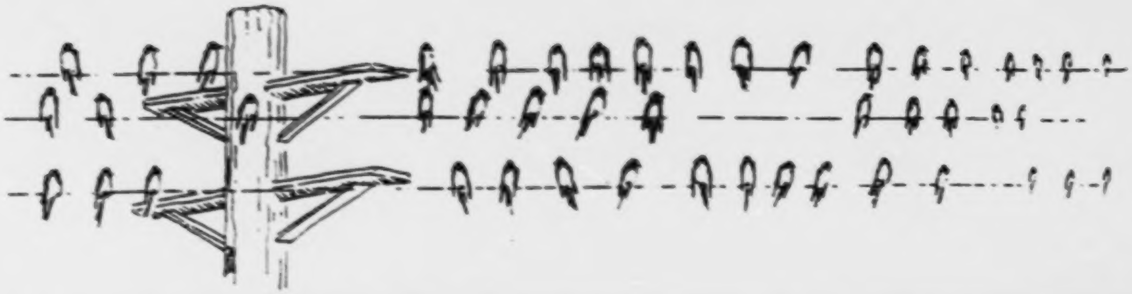
And so, with spring,
with the California lilac, the sleeping beauty, the columbine all
bringing grace to our woods,
with the geese, ducks and whooping cranes filling our skies and ears,
with the clouds pouring, puddles growing, and streams swelling,
take a moment to
  splash in a puddle,
  walk barefoot in the mud,
  learn something about a new wildflower,
  watch the geese against the full moon,
  find a new constellation,
  plant a new seed in your garden,
  teach a new activity,
  make a new friend,
  take a new field trip,
  celebrate a new occasion,
  or anything that makes you feel again like the child you are.

Western azalea
In Brookings, Oregon the Azalea festival honors this plant with its white with a touch of yellow and pink flowers

It's so beautiful she said
A little breathless with her speed
You never saw anything so beautiful.
It has come.
I thought it had come that other morning
But it was only coming.
It is here now!
It has come. THE SPRING!

Things are crowding up out of the earth, she ran on in a hurry. And there are flowers uncurling and buds on everything. And the green veil has covered nearly all the grey. And the birds are in such a hurry about their nests for fear that they may be too late, that some of them are even fighting for places in the Secret Garden. And the rose bushes look as wick as wick can be. And there are primroses in the lane and woods. And the seeds we planted are up. And pan has brought the fox and the crow and the squirrels and the new born lamb.

Mary, from The Secret Garden
Frances Hodgson-Burnett



Bird Watching Tips

HOW TO LEAD A SUCCESSFUL BIRD WATCH
OR
(How to succeed in birdwatching without really trying)

Every subject requires its own special teaching techniques, and Birdwatching is no exception. Many a field trip has been lost because the leader was not aware of the special techniques for handling groups in the out-of-doors. Here are some pointers for leading a group of kids on a birdwalk.

1. *BE ENTHUSIASTIC.* Don't worry if you don't know about the birds.

2. *TRY TO KEEP THE GROUP AS SMALL AS POSSIBLE.* Four to six is an optimum size.

3. *MAKE SURE EVERYONE STAYS CLOSE TOGETHER.* This prevents rapid movements when a bird is spotted and also helps keep group in touch with the leader.

4. *MOVE SLOWLY.* This will enable you to see more. How much can you see when you're moving down the freeway at 60 mph? In addition, moving slowly will not scare the birds.

5. *WATCH THE TREES FOR MOVEMENT.* Birds usually move around a lot and you can take advantage of this by letting your eyes go out of focus and scanning large areas with one glance. Your peripheral vision will pick out movement in the trees much sooner than if you try to focus on specific branches on the tree.

6. *USE YOUR EARS.* Birds will often give themselves away by calling or singing. A noisy group will not be able to hear sounds as well as a quiet one. Noise doesn't necessarily scare birds away.

7. *WHEN YOU SPOT SOMETHING, STOP.*

8. *AVOID MAKING SUDDEN MOVEMENTS IF THE BIRD IS CLOSE BY.* Pointing it out with your arm might just scare it away.

9. A trick for attracting birds which works quite well sometimes: Make a loud "Pshh, pshh, pshh" through your teeth. Some birds will come within a few feet if you're absolutely still.

10. *BE DISCREET. BIRDS ARE SHY.*

11. *VARY THE SPEED OF YOUR WALK.* Helps keep students interest.

12. Before you go out bird watching, assign various students in groups to be "experts" in each of the various types of bird groups. For example, one group may be "hawk experts", another may be "duck experts", or "sparrow experts", etc. During the field trip, divide the experts so that each group has an expert on sparrows, one on hawks, etc.

13. Use a checklist or make one as you go along.

14. Encourage students to use the field identification guides if you have them. Resist being an authority by saying "that's a so and so" and "there's such and such", etc.

15. While watching the birds, try to answer some of the questions about what they're doing, where they're going, etc.

16. Time of day makes a difference in what birds you will see. Early morning is best, before sunset is next best, and the middle of the day is the worst time.

17. Invite a parent or other adult who is interested in birds to come along. Birdwatchers are everywhere. Chances are there is one in your class somewhere.

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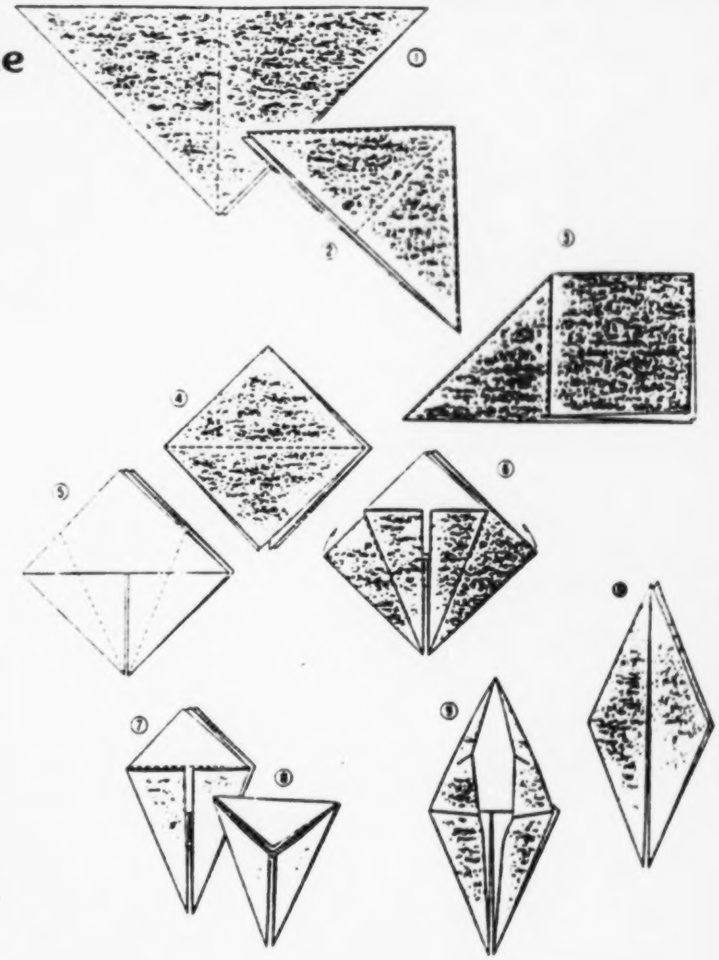
Origami . . . the magic crane



Crane Base

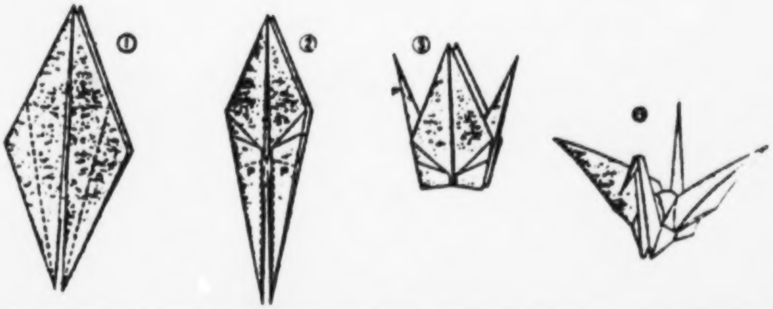
Use a six-inch square of paper.

1. Prepare the paper by folding it diagonally in half. Valley fold on the dotted line.
2. Valley and peak fold on the dotted lines, and bring the top layer point at the far right down to the bottom point to form the square you see in step 3.
3. Turn the model over and repeat.
4. Valley fold the top layer only on the dotted line.
5. Valley fold the upper layers only on the dotted line.
6. Peak fold the bottom layers around to the rear on the dotted line.
7. Valley fold all layers on the dotted line.
8. The model should look like this. Open it out again to the position in step 7.
9. Take the top layer only of the top point in your fingers, and pull it up into the position in the chart. Turn the model over and repeat.
10. The finished crane base.

Crane

Use a six-inch square of paper.

1. Begin with the crane base. Valley fold on the dotted lines, top layer only. Turn the model over and repeat.
2. Reverse fold the tail and neck sections outside in.
3. Reverse fold the neck section outside in to form the head.
4. Bend the wings into proper position for the completed crane.



TEACHING ENVIRONMENTAL SCIENCE IN THE HIGH SCHOOL

Students entering the environmental science class at Lake Oswego High School each fall are faced with many challenging questions about the quality of the environment. Can planet earth be cleaned of the chemical residues man's increasing population has produced? How many more animals will become extinct within their lifetime? Will Man's desire for more energy cause further deterioration of the environment? In answering questions like these, the students find that there are no easy answers, though our country is still in the process of working out solutions to many of these problems.

In teaching the class, in its sixth year, I have also found that I must constantly alter the materials presented to correspond with the rapid changes through the years. The 70's have been termed 'the decade of environmental awareness;' a time when we finally looked back on our devastated environment and decided that drastic measures must be taken to abate any further degredation. The study of the systematic attempts to improve our environment is the basic concept carried through the nine units studied in this course. (Water Pollution, Air Pollution, Land Conservation, Energy Use and Conservation, Endangered Wildlife, Forestry, Recycling, World Population Crisis, and Land Use Planning.) For the purpose of this article, I will examine one of these units to illustrate how this concept is taught.

The most extensive unit taught concerns water pollution and the process of monitoring water quality. During this eight week unit students are presented information on the sources of water contamination such as human sewage, industrial discharges, agricultural pesticides, oil spills, and fertilizers. The severity of the water pollution crisis is illustrated by reading several articles such as "Fresh Start For The Great Lakes," "The Willamette River-Water Quality Success Story," and studying the mercury contamination disaster in Minimata, Japan. The effect of chemical food pollution on animals is also examined by studying the reproductive tragedies of the Pengrine Falcon, Eagle, and Osprey. The use of the book Silent Spring, and movies "Pesticides in Focus," "Empty Nest" help teach about the dilemma we face about using pesticides. This issue is culminated by discussing the banning of DDT in 1972 and the conditional use of DDT on the Tussock Moth in 1974.

After several days of water pollution problems, the atmosphere within the class gets pretty depressing. Therefore, emphasis must be placed on the progress our country is making in solving these water pollution problems. Lectures present information on the Federal Water Pollution Control Act, Safe Drinking Water Act of 1974, and Oregon's Water Pollution Standards. These laws are briefly studied by looking at Oregon's permit system, general water quality standards, and discussing the function of the DEQ in enforcing and monitoring the water quality in our state. The Willamette River clean-up is used as a prime example of how these laws can produce results. Since more complete sewage and industrial waste treatment caused the Willamette recovery, students spend several days reading about the various stages involved in sewage treatment. The articles, **Primer On Waste Treatment** and **Breakthrough In Water Pollution** are used along with a slide presentation I have made on Lake Tahoe's tertiary treatment plant. Industrial waste treatment is illustrated very well by showing two films, "Problems of Conservation—Water" and "Great Lakes—A Matter of Survival."

To show that our environment faces new unsolved problems every day we spend time discussing the Safe Drinking Water Act and the threats of carcinogens in our drinking water supplies. I lecture on studies showing carcinogens in New Orleans water, production of chloroform by excessive chlorination, and the use of activated carbon filtering to remove organic contaminants in our drinking water.

To bring the water pollution issue into the student's own backyard, I have developed a water monitoring program that examines the water of streams and lakes within Lake Oswego. Before students can effectively study the water environment and produce reliable data, training must occur in the lab to learn specific techniques. The Milipere filtration technique for collecting fecal coliform, dissolved oxygen procedure, and the identification of aquatic organisms must be practices in class. Pond samples containing debris provide the materials needed for an indepth examination of aquatic life (everything from tubifex worms to dragonfly nymphs). Students learn to key the organisms and classify them as indicators of water quality. (Example: mayflies prefer well oxygenated water containing little organic debris.) All techniques taught correlate with the standard procedures used by DEQ biologists so that our data can be compared with theirs. Our data can also be compared to national standards for water quality. This will allow us to see how well Lake Oswego waters compare to those around the United States.

Once in the field, we examine three sites on Tryon Creek and three sites on Springbrook Creek. Eight to ten students are involved every two weeks after school. Six tests are performed at each site including dissolved oxygen, Ph, temperature, flow, fecal bacteria count, and biotic index. Along with these measurements, the site is examined for physical changes such as litter, fallen trees, siltation, fungus or bacterial growth, odors, weather conditions, and other animals sited. The dissolved oxygen and fecal coliform tests are completed back in the lab to insure accurate results. Standard methods are used to culture the bacteria and counts are taken the next day. The bacteria filters are preserved on 3 by 5 cards using contact paper and saved for further examination and evidence.

In 1976, the fecal coliform counts at one of our sites on Tryon Creek consistently registered high counts (4-6000 counts 100 ml). Upon examination of our data, the DEQ requested that we prepare a report on all the research done on this site. Upon receiving this report, the DEQ followed with their own analysis of this site and found results that correlated with our findings. Their further investigation led to several failing septic systems and a request that these homes be placed on the public sewer system. The students involved in the water monitoring project that year were very excited to see all their hard work pay off in the possible improvement of the environment in the stream.

As you can see by the unit presented, students learn about their environment through several different media, but the real learning occurs when they become personally involved in working with one of the problems facing their own environment. Besides the water monitoring, my students can also get involved in running the recycling center located at the high school. This year I hope to interest even more students in the process of environmental legislation by interning students with the Oregon Environmental Council and participating in the state legislature. It looks like an exciting project which I hope other teachers will try to apply to their teaching curriculum.

—Ken Becker
Lake Oswego High School

Investigating Environmental Issues in the Classroom

Concerns about various aspects of our impact on our environments are important to explore, for these issues are very close to us in many ways. But in dealing with an issue, it is often hard to understand the full picture because our information sources are limited or our background of information is not complete. The following is an outline of the steps you might take while investigating an environmental concern or issue. These are guidelines that can help you and your students begin to understand the various perspectives and factors involved in an issue. This outline is a summary of a 30 page lesson plan developed as a part of the U.S. Forest Service "Investigating Your Environment Series. A full copy is available free from USFS, P.O. Box 3623, Portland, Oregon 97208

Guidelines for Investigating an Environmental Issue

Describe the Issue:

What is happening
Where is it happening
Why is it happening
Who is affected and how
What is impact (economic, aesthetic, social, political)
What are possible alternatives
Is Env. Impact Statement involved

Collect and Record Information

List factors that might contribute
Describe what you want to know about factors
Describe kind of data needed
Identify information sources for this issue
What more do we want to know
How will we find out

Interpret Information Collected

Describe what information tells you about issue
Identify cause-effect, comparisons, contrasts that can be inferred from data
Identify parts that can be investigated further

Analyze the Impact

Identify impacts on other environments, social patterns, economics, politics, other
Identify impacts on other areas

Identify Passive or Active Interest Groups

Who is interested, how and why
Who should be interested, how and why
Who is affected, how and why

Analyze the Interest Groups

Identify questions each interest group is concerned about
Summarize points of view of interest groups
Identify interest group history

Analyzing Factors and Alternative to Present Conditions

Identify factor
Identify how it contributes to issue
Develop or describe alternatives
Describe how change will affect issue

Analyzing Possible Courses of Action

Develop list of possible courses of action
Identify advantages and disadvantages of each (impact)

Develop Action Plan that Could be Used to Implement Recommendation

Identify recommended solution
Identify action necessary to implement recommendation
Identify who could help implement it
List steps to implement
Identify how to follow up and evaluate

Establish Criteria to Evaluate Recommendation

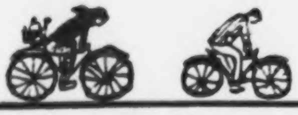
Evaluate Overall Process

Analyze Information Sources

Evaluate the Process

BikeSpring '78

Bikespring '78, a celebration of the bicycle and cycling is another of the project's efforts. The week long celebration in the city is being coordinated by Mark Wheeler. In addition to slide shows and lectures on touring, bicycle races, family tours, free repair center, and a variety of other events, Mayor Goldschmidt will ride his bike to city hall and officially proclaim **Bikespring '78**, May 27-June 4. As well as a festival and celebration, Bikespring is a serious attempt to raise citizen awareness of a responsible alternative means of transportation. "More than anything, we want to help people discover and experience the joy of cycling," says Mark. And we're already looking to Bikespring '78, '80 and beyond. For Bikespring schedules and more information call the CR office. A blueprint for organizing Bike weeks will be developed early this summer and will be available through CR.



Tips for the Urban Biker

With summer upon us, and in the midst of planning for the next few months, we should keep the bicycle in mind. If there was a season for the bicycle, summer would be the one. And if there was a season for bicycle accidents, it would be the same. This month might be the best time of all to plan some bike trips and to help students understand some basic rules of bicycling. A little attention now just might save a few skinned knees, broken bones, and deaths this summer. The following are some tips to help anyone planning to ride a bicycle this summer.

You might want to go over them with your students in any class or any age sometime this month. If you wanted, you could have students make charts displaying them in the classroom or school hallway. You could have students write and act out a small play or skit using all the bicycle rules. You could even encourage students to hold a bike day and ride to school, invite a bike mechanic or bike specialist to your class to talk. (CR staff is available for this, or contact a local bike shop or police station.) These rules are intended to help us become more aware of the care necessary when riding bicycles. We believe that with care and awareness the true joy of cycling will shine through for all who ride.

- Bicycle drivers have all the rights and responsibilities of other vehicle drivers.
- Drive your bike like you would drive a car.
- When riding on arterial streets ride in the middle of the lane unless there is enough room for a car or bus to safely pass you.
- Never bike against traffic on the left side of the road. Your chances of having an accident are much greater there, you have less time to avoid an accident, and the force of the collision will be greater. (You're also more likely to run down an unwary pedestrian or another biker!)
- If you ride at night, make sure you use lights — both front and rear (reflectors are not good enough).
- Be wary of left turning cars; you may think they see you, but chances are they don't. Never assume you've been seen.
- Signal your turns by pointing the direction you want to go and turning around to make eye contact with drivers to the rear.
- At intersections or driveways watch out for right turning cars, they may turn right in front of you.
- Slow down for pedestrians on bridge sidewalks.
- Obey all traffic laws and signals.
- Remember: good, courteous and predictable bicycle riding is the best way to teach motorists about sharing the road with bicycles.

Low Cost, Efficient Transportation

- 10 speed bicycles are as fast as cars for trips of up to 7 miles (here we are talking about total time from portal to portal).
- The 10 speed bike is the most energy efficient form of transportation.
- Cars use 10 times the total energy of a bike rider.
- 100 bikes can be made from the materials needed for 1 automobile.
- The annual costs for a bike are $50, for an automobile $1,170.
- 2½ billion gallons of gasoline could be saved each year if trips of less than 2 miles were taken by bike.
- Bikes get the equivalent of 1,100 miles per gallon.

From TRANET, a publication on appropriate technology, available from the Greater Philadelphia Bicycling Coalition

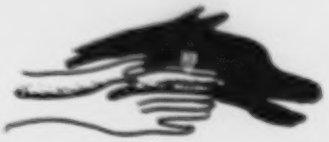
Spring is here and days are slowly growing longer. But for those cold rainy days still ahead, activities, including ones in environmental education, may have to focus inside the classroom. Shadow puppetry can be a new method for presenting research material, re-enacting historical events or depicting an ecological situation.

Shadows on the Wall

By Linda Carlotta Stiel

Long ago folks used to sit during the evening by *candlelight and make shadows by the lights of their fires. Have you ever been in a darkened room with a candle and watched the shadows dance on the wall? On the ceiling? Well, you can imagine* *ghosts and goblins, even monster shapes or great Knights of Yore! With a little imagination, here are some things you might do with the light from an* energy *saving candle and the magic of the shadow!*

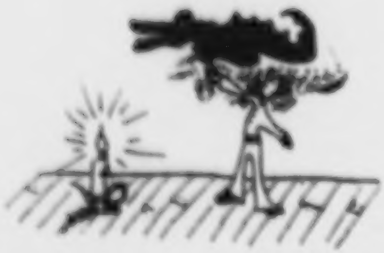
Hand Shadows:



Linda Stiel is a free lance puppeteer here in Portland. You can find her shadow at 2315 SE Ankeny, Portland, OR 97214; (503) 235-3017.

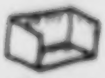
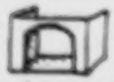
A Puppet:

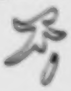
Simply cut a shape out of stiff paper and attach to a handle. To move, pull the puppet in and out of focus.



The wall is where this dragon roams.

Puppet Theatre:

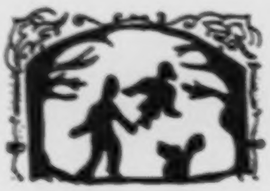
Cut a cardboard box until you have 3 sides and a bottom  *. Cut a procenium* in the front,*  *and paste tracing paper or a piece of old sheet over the opening.. Cut puppets as above but with a seperate arm, leg, or—!*

Attach it with a *brad, through a hole you have punched . Attach a drinking straw to both the body and leg, using a stapler. Now you have a puppet!* 

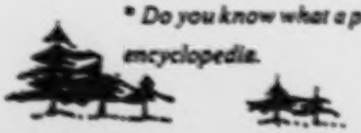
Place a candle behind the screen; put your puppet up next to the screen of tracing paper. Turn out the lights *and* Allakazam! *. You have a moving puppet show!*

Cut out scenery and tape it to the screen. Add animals and other characters and you might come up with this:

A young man finds out how creatures live in the forest. Who tells him? Why, the animals themselves as they hop or fly about. Even the tree have something to say. In a puppet show, everyone can talk!



** Do you know what a procenium is? Can you guess? Look it up in a dictionary or encyclopedia.*



Organizing For Action

by Mike Soule

"For a group wondering how to get action started, there is a simple precept. Go out, walk and explore. There is no more useful tool for getting a local movement started than involving people in an inventory of community resources. It gives the group a clear task, is interesting and important as well."

Organizing a Community EE Council

The first essential step in organizing for action on either an individual or group level is to gain a clear and holistic view on the present situation in the community. These questions, offered by Ernie McDonald of the USFS in "Developing an EE Action Plan" are a good start in assessing your community.

Is there an EE committee in the community?

What programs exist in EE from K - Adult?

Are programs action or process oriented?

What workshops, courses, training programs have gone on over the last few years?

What plans are there for workshops or community programs?

A good place to begin is at your county ESD, extension service, any local college or university, or city parks and recreation offices. Once you find someone with some information, you can usually get a list from them of others. From there it snowballs. We have found it best to use 3X5 cards for each person we talk to or to have a separate page in a notebook for each. Six months down the road, you'll be thankful you organized yourself early.

Questions to ask people in the community to help get the most out of your assessment are listed below. Don't forget to ask people in business, industry, and local government the same questions. Usually they have valuable input in areas such as the following:

Programs they are presently involved with.

Other programs they know of.

Other people they know of (the ones they think most valuable).

Their perspectives on what EE means.

The next step is to identify any voids or common concerns that are evident among the programs and to get a group of interested people together for a meeting. Try to get representatives from a broad range of agencies and organizations. For planning the meeting, "Preparing for Public Involvement," by USFS, has a valuable section on meetings and their dynamics. Once the group is together there are a series of steps and tips that can be helpful in organizing to create successful planned change.

Try to keep the group directed toward an action, be it just another meeting, a community inventory or some EE project.

The following are some steps compiled to help any group organize and work toward a change.

Identify how needs might be met.
Identify key people.
Identify projects.
Identify steps to projects.
USFS, Ernie McDonald, Ed.

Clarify your vision.
Know the people you are working with well.
Continually test your perceptions.
Understand the momentum against change.
Know the policy making process.
Be committed.
Know how to run a meeting.
Don't forget a few good stories or occasional celebrations.
Involve the media.
Know community and political structure.
Do necessary homework.
Steve Schneider, CUE

Information and resources in each of these areas is available through the USFS, and the EE project.

Resources

A few helpful resources for organizing community involvement are listed here. This list is by no means exhaustive. Any library, citizen group or community organization will have resources and ideas on the process of organizing for action in EE.

Preparing for Public Involvement
Environmental Education Office
U.S. Forest Service
P.O. Box 3623
Portland, OR 97208

This 60 page booklet leads one through a series of process oriented activities and lesson plans about group process, citizen involvement and planning. The topics, ranging from organizing a meeting to identifying an audience, include valuable information for anyone involved in working with the public.

Community Action for Environmental Quality
Citizen Advisory Committee on Environmental Quality
1700 Pennsylvania Ave. NW
Washington, D.C. 20006
1970

A guide for citizens who want to participate in practical community action. This 42 page booklet addresses open space, recreation, clean air and water, and education with ideas and questions to be considered.

Citizen Initiated Involvement in Urban Community Change

This is a report developed by three teachers in Earth Resources Ltd., a 'resources and the future' course held this summer at Portland State University. The booklet describes in detail the chain of events and activities leading to the development of Tryon Creek. It also has a list of other resources in the field and agencies in the Portland area who can help in developing action plans.

Developing an Environmental Education Action Plan
Information Office
U.S. Forest Service
P.O. Box 3623
Portland, OR 97208

A 37 page booklet outlining the steps to successful action in developing an environmental education council, teacher workshops, environmental study or learning areas, and environmental education curricula.

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Let Yourself Grow—
School and Community Gardening

by Shannon Smith

This is just a quick overview of gardening projects throughout the state. They provide examples of basic programs, offer special services to teachers and students or have a special approach to gardening.

Kids are like plants! A little water, some food, and sunshine and they sprout up and grow like crazy. Of course, there is more to it than that; love and good care are necessary for the happy, healthy growth of both children and plants.

People and plants go together naturally. Give a plant a person to care for it and it will thrive; give a person a garden, and it will nurture his curiosity, smiles, sense of achievement and pride.

We live in a green world. The gray concrete of our surrounding cities may sometimes make us forget this. Still, things are growing in Oregon — in our city parks and school yards, in our countrysides and quiet backyards. Throughout the state, programs for gardens and growing projects are flourishing. They are bursting with enthusiasm, creativity and learning potential and are as healthy and strong as the plants they grow.

School Gardening

Schools and classrooms often take field trips to see "nature in action" at parks and natural places around the state. Those same schools could have "nature in action" right outside their school windows where the lawn grows peacefully beside a sign that informs them "Keep off the Grass." Imagine walking by your school and seeing ripe tomatoes, carrots and pumpkins being weeded on a sunny day; or view a class creating a salad of cucumbers, lettuce and spinach that they have grown; or watching corn stalks topple over to become cornhusk dolls at the end of the season.

Educational possibilities in gardening are vast: food and nutrition, botany and agriculture, photosynthesis and energy systems, to name just a few. The social aspects of classroom gardening could be just as important. Interaction with others, learning cooperation and patience, achieving a common goal together and older students teaching younger ones.

Community Gardening

Gardening presents the relationship of plants, energy, food and man. But beyond that, gardening is unifying. It provides many neighborhoods with rewarding "group" accomplishments. The appeal of community gardening is as varied and diverse as are the faces of the gardeners. Old and young participate, new families and large join in, many conscientious environmentalists and some very concerned economists grow. It is clear that gardening is being enjoyed by everyone and that education in this field has no age limit. Gardeners from nine to ninety-five, are learning from the earth.

Gardening can be an outlet for older citizens. It can ease the burden of the high cost of produce for individuals on a fixed income. But more importantly it gives them a chance to feel valuable once again, involved and active within the community once more.

Gardening is not some magic cure-all. It is not for everyone. But a large group of people are tilling and harvesting the soil and finding it rewarding, enriching and astonishing fun.

It takes time and dedication to transform a piece of lawn or field into a garden of quality. But look in at the next greenhouse or garden you pass . . . look. The energy is there, and the learning opportunities are waiting. We invite you to begin something — and let yourself grow.

Local Self-Reliance—Community Gardening

By Lynn Mathews, Eugene Parks and Recreation.

Community gardening is one of the fastest growing outdoor activities in America. It is a low-cost opportunity for city people of all ages, incomes, and backgrounds to not only recreate, but also reduce food costs as much as $200/yr. The gardeners pay a small fee in exchange for a tilled plot with water. Gardeners provide tools, hose, fertilizer, seeds, and hours of care, weeding and watering.

The appeal of community gardens has many levels. It produces the freshest possible vegetables. It kindles a pride and sense of effectiveness on one of Life's basic activities. It provides a place for sharing among neighbors as well as a focus for other community involvements.

Sources of Land for Community Gardens

Unused city, county or state property have been the major source of land for gardens. Other possibilities include: churches, schools, hospitals, libraries, detention homes, housing projects, and even private investors. If private landowners donate or lease land, the community gardens program should maintain insurance against any accidents on the property.

Guides for Community Gardens

Recreational Community Gardening: A guide to Organization and Development.

By Susan York Drake, Bureau of Outdoor Education. Includes funding sources, budgeting, staffing and examples. Write Supt. of Publications, U.S. Government Printing Office, Washington, D.C. 20240.

Community Garden Sheet Fact.

Order from Rodale Publishing Company, Emmaus, PA. 18049.

Grow Up.

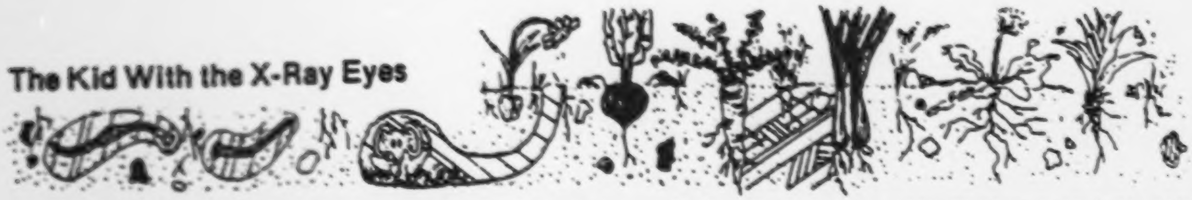
Periodical intending to spread information about organizing community and school gardens. Order from Neighborhood Arts Program, 165 Grove Street, San Francisco, CA. 94102. *Grow Up*, vol. 1, No. 4 features School Gardening."

Other Helpful Organizations

— The Institute for Local Self-Reliance, 1717 18th Street NW, Washington, D.C. 20009.

Write for their free publications list describing ongoing projects in urban agriculture, waste utilization and community development.

The Kid With the X-Ray Eyes



We have always believed that the gardener blessed with a green thumb must have X-ray eyes. As he walks through the garden he seems to see into the soil. He knows how deep and wide the roots go — how much is "too little" and "too much" water.

Give your students the ability to watch the action below ground by building a number of root-view boxes. A diagram of the box is shown here. The dimensions of the boxes are not critical. They can be as long as you want. Small boxes are easily handled and can be used in multiples for comparative tests.

The slanting transparent side is necessary to force the roots to hug the window side. The window should be covered with dark cloth or paper except at viewing times, since some roots tend to grow away from the light source.

You can use the boxes to demonstrate many features in plant behavior:

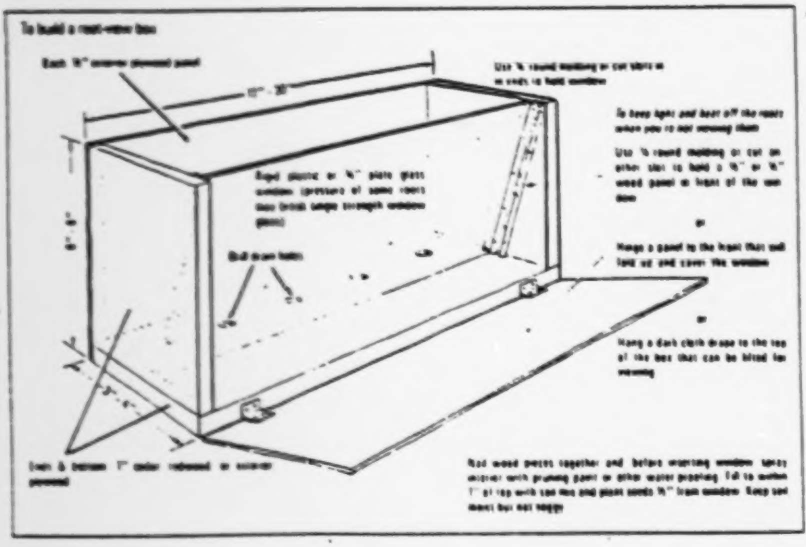
How roots develop in an ideal soil and a problem soil.

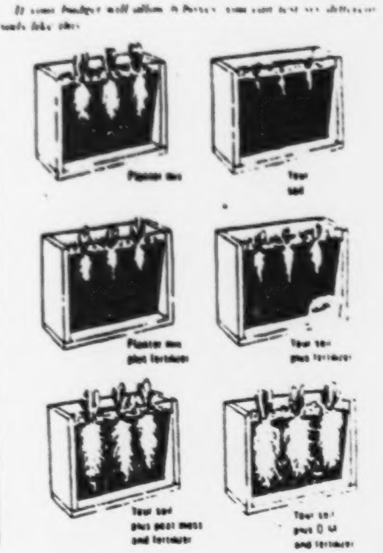
How water moves through various soil types.

How plants respond to fertilizers.

The number of possible experiments is limited only by your imagination and the number of boxes you build. Two or more boxes will multiply your demonstrations.

(From A Child's Garden, see Resources)





Your Garden: A Work of Art

Have students design garden beds and paths in creative shapes and designs. You don't have to use just rectangles and have straight sides in planning a garden.

Think about:

Color. Plants are many different colors besides green. Vegetables can be as colorful as flowers. And green plants have a raiety of interesting shades of green, too.

Pattern and Shapes. Look at the many shapes and patterns in plants. Look at leaf shapes, flower designs.

Textures. Have you ever compared the texture of spinach and radish leaves? Peaches and apples, curly leaf lettuce and cabbage?

Smells. Herbs and flowers can add a variety of scents to a garden.

Use seed catalogs and garden books to discover colors, patterns, shapes and textures. How about a special smelling session with herbs or a tasting session with the sprouts of vegetable plants

Tips for Backyard/ Schoolyard Composting

By Jack Bates, Harvest Fairletter, Eugene, Oregon, 1978.

- Have a covered container in kitchen for organic wastes.
- Smaller pieces break down faster.
- Use a variety of materials: vegetable scraps, straw, grass clippings, manure, sawdust, paper, coffee grounds, sludge, barbershop trimmings, lime, leaves. DO NOT USE animal or fatty substances since these decompose slowly.
- Keep your compost pile covered with dirt and/or straw to avoid stray dogs, rodents, flies, slugs, odors, and irritated neighbors.
- The pile should be at least 4 cubic feet to effectively "heat up."
- Add a high nitrogen material (manure, grass clippings, cottonseed meal), regularly to accelerate decomposition.
- Turn the pile every few weeks for aeration.
- Bloodmeal, fish emulsion, seaweed, granite dust, and rock phosphate add trace minerals, but are not necessary.
- The pile needs to be kept moist — watered in dry weather and covered in wet weather.

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Adopt A Crop

> "Teach me to hear spring's voice, the small boy asked. I'd like to if I could, said the old man, but the thing is, you have to learn it from the birds and rocks and clouds and seeds and weeds and things like that. They do the teaching around here. But how do I start, asked the boy. Do this. Get to know one thing as well as you can, it should be something small. Not an ocean, not a mountain. Start with one seed pod, or one dry weed or one butterfly. When you have learned to respect that seed pod or bee and to care for it, then you might hear its voice."
>
> adapted from The Other Way to Listen,
> Byrd Baylor, Peter Parnall.

Objectives:

Provide students with experiences that will:

(1) Involve them in the process of spring with a hands-on learning experience.

(2) Help them develop a relationship with one of their favorite foods to build understanding and strengthen the link between student and nature.

(3) Help them gain a greater understanding of plant growth process and biology.

(4) Help them gain a better understanding of their role as stewards of this planet.

(5) Help them gain a greater understanding of the agricultural needs and resources of our region.

Process:

(1) **Exploring the Plant Kingdom.**

(It is essential that first we learn where plants are in our lives, and develop a sense of caring for them, before we begin to plant our own.)

- bring old seed catalogs to look through, and make a collage of drawings or pictures from the catalogue.
- visit a local greenhouse or nursery to see what is happening there, and talk with the nurseryman or gardener.
- explore where plants already exist in the classroom, school, or at home. Get students to talk to their parents about the plants at home, and to participate in their care. Have them bring in plants or drawings or information about theirs.
- bring some plants into the classroom and let students help in caring for them.
- form a plant society of those who have shown some caring or respect for plants.

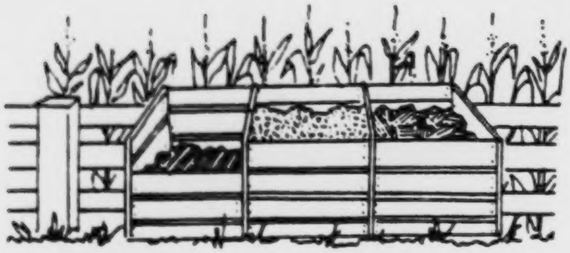
(2) **Choosing the Crop.**

- have students decide which is their favorite crop and Adopt it. You can have an official adoption ceremony where students sit in a circle and talk about why they chose their plant, what it means to them. You can even have them take an oath of "good parenthood," stating they will care for plant to the end of its growing season.

(3) **The Crop Handbook**

- help students make their own books with a construction paper or cardboard cover.
- their task as parent then is to learn all they can about their crop child.

  Some suggestions:
  What does my plant need to grow?
  When can it be planted?
  Special nutritive requirements.
  Other companion vegetables.
  Can it be started indoors?
  What kind of care does it need?
  Where does this plant come from? Is it native?
  How long until maturity or harvest?
  How should it be planted (closeness, or deepness)?
- share the books with each other, giving "authoritative" lectures on your crop. This is fun to do outside or at one of your class plant society meetings.



(4) **Plant your Vegetable.**

—prepare in the classroom for planting by exploring soil, sprouting, potting techniques, seeds.

Soils:

—have students bring in soil from home and explore color, texture, water holding capacity, or acidity (litmus paper can be fun!). Make sure you get your hands in it so you all can begin to feel the differences in soil.

—it is fairly simple to set up a soil learning center in a corner of your room with a few fun activities. Smell it, rub it, put water in it and form it into a ball. Explore differences between separate soil materials and composite samples from the yard.

—have students choose and prepare the proper soil type for their plant needs.

—you can also have students bring in some vegetable food scraps from home, leaves, grass clippings, ashes, sand, sawdust, other small bits and put them in a bucket to make compost. This really helps to show how soil builds itself up. Put it in a corner of the room and watch it now and then. You might have a compost report every week. Remember that compost needs to be covered and to have air and needs to be turned regularly each day. Outside is best to do this, but it can work in the classroom.

Seeds:

—you can also set up a seed learning center, bringing in a variety of different seed types (alfalfa, mung, peanuts, lima beans. . .) and letting students sprout them. Alfalfa and mung are great for this because they need little care and can be eaten at the end of a week.

—using the most appropriate method and materials, plant your seed or stem or whatever. You can have a formal planting ceremony blessing each plant, sprinkling each one with water from one special cup.

—root chambers are also a fun addition to the classroom.

(5) **Watching them Grow**

—once you have started your seeds in the classroom, use your book to record the growth. Some of what you might want in your book includes:

measurements (daily or weekly)
charts, graphs

—you can put up a crop calendar for each student to record the day planted, expected harvest date, and growth.

—use your book as a plant diary including some writings about what it feels like to be a plant. Some questions you might ask:

What does it feel like to be my crop?
How does my plant feel about me?
How would it feel if I forgot to water it, or watered it too much?
How does it feel about other plants or insects?
If your plant could talk what would it say?
How do you know if your plant is thirsty, hungry, lonely, not getting enough sun?
(Remember, talking to your plants really helps.)

—pictures, information drawings, songs and other items may be put into the books.

—when some research is completed, you can begin to have students write poems or draw pictures about their crop in their books. (Poems are easy. Just have them write 6-10 words or phrases that describe their vegetable and their feelings about it. Then help them form those into poems.)

(6) **Planning the Garden.**

—one really fun part of this is planning the outside garden. You can use handbooks made by students to determine proper soil, sunlight and water conditions.

—go out to your plot. Have each student be their plant and stand in the place they'd like to be. Teacher can make a map then of garden and have children color the map in. Remember information on companion planting, which plants like which others.

—here you can have another planting ceremony.

—if you do a garden, it is likely that most of plants won't be grown enough to harvest by June. Some arrangements need to be made to care for garden. It is a good summer project for a student or group, and important for class to know that their efforts are not in vain.

Green Thumb References

Books, publications and guides

Gardening With Children: A Guide for Parents and Teachers.

By Thom and Patty Dunks, Harvest Press, Santa Cruz, 1976, $.95. For adults who are teaching children to garden. In most ways it's another book on gardening with a couple of great graphics by James Otis.

The First Book of Gardening.

By Virginia Kerkus. Basics for children, from how to use tools properly, to pinching tomato suckers, to identifying both friendly and enemy garden creatures. (Most public libraries carry an assortment of similar books in the children's section.)

Growing Up Green.

By Alice Skelsey and Gloria Huckaby, Workman Publishing Co., NY, 1973. A book specifically about gardening with children: starting seedlings, doing demonstrations to illustrate plant properties (e.g. phototropism), special gardens and projects.

For urban schools who may need some special insights into gardening porjects and for you city folks:

The City People's Book of Raising Food.

By Helga and William Olkowski, Rodale Press, Emmaus, PA. 1975. An excellent book for beginning and urban gardeners. Along with the practical, easily read techniques for starting a backyard or rooftop garden, this book tackles specific problems of gardening in a city. There is also a section on producing meat in an urban environment by raising your own chickens and rabbits.

Agriculture in the City.

Community Environmental Council, 109 E. De La Guerra, Santa Barbara, CA. 93101. $2.75. Tells the story of a project in Santa Barbara, Calif. Really good reading.

Community Garden Handbook.

Hunger Action Center, The Evergreen State College, Olympia, WA. 98505. Gives all the essentials of setting up a community garden anywhere, with details of the Seattle gardens.

Publications and periodicals

Small Farmer's Journal.

Beautiful, large format quarterly loaded with practical information — soil, livestock, equipment. $8.50/yr. Order from 94262 Oaklea Dr., Junction City, OR. 97448.

Tilth Newsletter.

Journal of organic agriculture in the Northwest. Covers fertilizer, bees, greenhouses, urban farming. $5/yr. Write at Rt. 2, Box 190-A, Arlington, WA. 98223.

Pacific Horticulture

Published quarterly from the Pacific Horticultural Foundation, Hall of Flowers, Golden Gate Park, San Francisco, CA. 94122. This journal carries timely articles on western horticulture. $5/yr.

How to Grow More Vegetables Than You Ever Thought Possible on Less Land Than You Can Imagine.

John Jeavons writes wonderfully on how to grow so much with so little (except loving hand labor). Published by Ecology Action of the Mid-peninsula and available at some bookstores for $4.00.

For Drier Climates

Garden projects in drier parts of the state face different problems, among them how to cope with water-conserving landscapes. Some resources that will give you some idea of how to approach these problems are:

Easy Gardening with Drought-Resistant Plants.

Arno and Irene Nehrling, 1968, $3.50. Dover Publications, Inc., 150 Varick Street, New York, NY 10014. "The most complete publication available," says RAIN magazine. Published in response to the eastern drought of 1966, it offers sound information for any gardener from soil improvement techniques, water guidelines, landscape design, to an extensive guide to drought resistant plants.

SUNSET

Lane Publishing Co., Willow and Middlefield Roads, Menlo Park, CA. 94025. The trend setting magazine of the Western states offers practical suggestions for gardening, from landscaping with rocks to recently introduced plants. See specifically the issues: "Drip irrigation," July 1976, "Frugality with Garden Water," June 1976, "Looking Good . . . Unthirsty," Oct. 1976, "Water Short Gardening . . . Here are some Guidelines," April 1977.

A Child's Garden: A Guide for Parents and Teachers.

There is a warning at the beginning of this good resource: "We expect our readers to be imaginative, creative, curious and resourceful."

Many of the pages in the book are designed for teachers and students to learn together, like talking to a plant named Joey who answers those plants questions. Some of the suggestions may lack detailed instructions (while others do), making you, along with the students, think out the best paths to follow.

A Child's Garden contains a good look at how a Children's Adventure Garden is working, a teaching guide for use with the film "Growing, Growing," good illustrations to answer many of your "beginner's" questions on gardening, and a good directory of vegetables and their pecularities.

From the Chevron Chemical Company, Ortho Division, 200 Bush Street, San Francisco, CA. 94120.

Just give me a clue on how to start, I said.
And so he said, "Do this: go get to know one thing as well as you can. It should be something small. Don't start with a mountain. Don't start with the whole Pacific Ocean. Start with one seed pod, or one dry weed or one horned toad or one handful of dirt or one sandy wash . . ."
He said he started with one tree.

From "The Other Way to Listen"
B. Baylor, P. Parnall

Start with One Tree

Notes on bringing Nature into the classroom this year.

by Michael Soule

Every time I plan a class, workshop, or presentation I find myself asking the same question, where to start? Knowing that the beginning is all important, the moment that sets the tone, the rhythm, and the mood for all that is to come after. It's the same with the school year and fall. We come wondering what kind of experiences we can start to help set the right rhythm for bringing nature into the school year. What activities will help the children, the class, establish an initial relationship with nature that will grow and be built upon all year? Steve Van Matre of Acclimitization always says to start where the learner is, to start with something familiar and let that place grow until the unfamiliar becomes familiar. Start with one simple small thing that is already a part of the learner and to move from there.

Over the years, I've grown to feel deep respect, awe and connection with trees (more than any other aspect of nature). Partially because of some special trees in my childhood, partially because I planted trees when I was young, and partially because I have a strong sense of the role trees play as guardians of the earth. Trees are greatly responsible for the health of the earth; they hold soil, create the air, provide a protective skin to the land. For millions of years they have maintained the balance of conditions on this planet that make it possible for us to exist. So it is with this understanding that in searching for a starting place, a familiar place in all learners, I look to the trees.

The philosophy of Project Learning Tree says, "Start with one tree and branch out from there. Everyone has at some time in their life had a significant relationship with a tree. We build upon this relationship to grow greater awareness and understanding of the natural world and our interactions with it." The first activity in the PLT program is called "Adopt a Tree," and provides a theme and context for many of the other experiences.

We'd like to share this activity with you as a way of starting the school year, of beginning to establish that relationship between the student and nature.

Adopt a Tree

(adopted from Project Learning Tree)

Go outside and have each student adopt a tree they choose to be their friend for the year. Allow them some time to get to know their tree. When initially exploring their tree, we find it helpful to give them some small tasks to do to help them focus their attention. Make sure you give them plenty of time to *be* with their tree. Some was to explore it includes:

Explore it blindfolded.
Make a charcoal drawing of it.
Name it.
Let it tell you a story to share with others.
Smell it, touch it, listen to it.
Clumb it, hang in it, hug it.
Measure it around and up / down.

We usually have each student make a tree booklet to put their drawings, observations, leaves, bark rubbings, and other tree related things inside. Some other activities we've seen work are:

1. Brainstorm from 10 to 15 adjectives that could be used to describe a tree. These words can be used to write a poem (haiku or cinquain) or short paragraph about the tree. (See Bibliography, numbers 125, 127, 128 and 345.)
2. Create and present a short story, puppet show, or play about the tree's parents and/or its offspring.
3. Imagine sounds you might hear near the tree. Can you hear leaves moving, animals, birds? Write a brief description of these sounds inventing appropriate words, if necessary. Imagine you are looking at the tree. What colors and shapes do you see? Write a brief description, using your new words, of how the tree looks, smells, feels, and sounds.
4. Write a brief, imaginary conversation with your tree. What might your tree think, see, feel, hear, and smell? (You may wish to record the conversations on tape.)
5. Imagine you are a radio or television reporter interviewing a person, bird, or animal that lives in a forest or in a tree. Write down some questions you might ask, such as: How do you like your home? Who are your neighbors? What do you do for a living?
6. Take a tree to lunch. During lunch, consider these and other questions:
   What is it like under the tree?
   What animals visit the tree while you are there?
   What kind of help is the tree getting from people, if any (watering, feeding, pruning), and does it need that help?
   Why and when does it need help?
   What kinds of things, if any, are damaging the tree?
   Has the tree cast seeds? Have any seeds developed into seedlings?
   How does the tree take care of itself?
   How much of its history can you observe? Has it had any accidents (such as being hit by lightning)?
   Is the tree crowded by other trees or by buildings?
7. See whether your tree makes a shadow. Watch the changes in your tree's shadow at different times of the day and during different times of the year.
8. See whether you can use your tree, without hurting it, to make a sundial. Can it help you keep time?
9. Make paintings, drawings, or photographs of the shapes and shades of color you find when sunlight and shadows can be seen on and around your tree.
10. Describe your tree in enough detail so that someone else can recognize it. Share what you have learned by inviting someone else to visit your tree — and be sure to visit your friend's tree, too.

We repeat the visits throughout the year to note changes in our trees and compare observations. We also find that the students enjoy having other time with their trees. Time to sit, writing or reading, quiet time, or just time away.

Once you get started with this activity, you'll find the extensions for the classroom are limitless. They just keep growing. One of the ways we've used Adopt a Tree is to have each student actually plant a tree the first year and care for it throughout the year. It is inspiring to see what happens when a child is given responsibility for a part of the earth. But any way you use it, it is only a beginning, a small activity that will branch out throughout the school year.

□

CHILDREN OF THE GREEN EARTH

When you plant a tree with a child
It opens up your heart.
Every time you plant a tree
The earth gets another start.

This growing worldwide association of individuals was established to help children plant trees and do other earth healing work and connect with each other. It is a cultural exchange-sharing program between children involved in local community projects all over the earth. The premise of the work is simple: if we work with our children planting and caring for trees, and ehip them share their work with others, they will develop a very strong personal connection with the natural earth and with each other in their lives. This fosters what is most needed on the earth today, world unity and care for the Earth. The outcome of the work is also simple: tree planting programs, international pen friends, seed exchanges, memorial arboretums, or tree children gatherings. Here in the Northwest, the work of Children of the Green Earth is focused on identifying existing tree planting programs, helping them to link with the vision and each other, and providing assistance to people who want to establish an effort in their local home place.

The formal association was founded in July 1980 by Rene Dubos, Richard St. Barbe Baker, Dorothy Maclean, and others at the United Nations in New York City and has been growing since.

For more information or assistance in connecting your efforts with Children of the Green Earth or starting an effort in your local area, please contact us.

From our hearts,
With our hands,
For the earth,
All the world together.

David, Ron, Michael Children of the Green Earth
Star Rt. Box 182, Umpqua, Oregon 97486 (503) 459-3122

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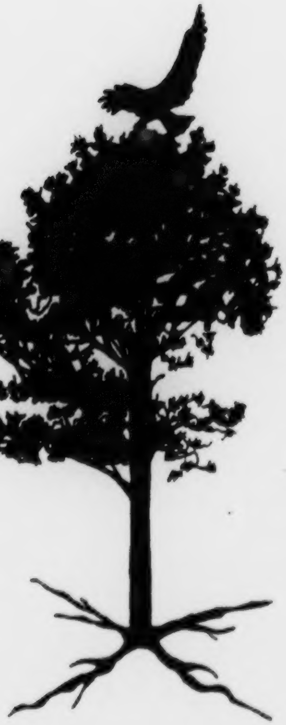


And he planted a pine tree, and called it the tree of peace, and four roots spread out, to the four directions. Then he uprooted the tree, and took all the weapons of war and threw them in the hole under the tree, and then he planted the tree again. In the topmost branches he placed an eagle, to watch and cry out if any evil approached the people. And it was said, roots have spread out from the tree of the great peace, one to the north, one to the east, one to the south, one to the west. These are the great white roots, and their nature is peace and strength. If any man or any nation shall obey the laws of the great peace . . . they may trace the roots to their source . . . and they shall be welcomed to take shelter beneath the tree.

The Great Law of Peace
Deganamidah (Iroquois)

"Adopt A Tree" and more . . .

Esther Heilbronner, an elementary teacher in Sublimity shared with us some of her experiences using the ADOPT a TREE activity with her second grade children.

"Sublimity Elementary is a small rural school located amid rolling farm hills and an occasional stand of evergreen trees. In the distance they see vast forests march up the slopes leading to Snow Peak Mts.

"Our students are surrounded by a natural beauty they often take for granted. Many times they have very little thought of how to care for their environment. When they are physically and emotionally involved with the trees in their environment they have become very sensitive and protective of their 'adopted' tree friends. For example, a student from two years ago approached me with a comment, 'My adopted tree has some broken branches'.

"For about four years I have built much of my physical science and social studies around the tree. Month by month and season by season we 'grow' with our trees."

MARCH: We observe the changing trees of our playground. We now decide to find a "personal friend" and adopt it.

We have "Official" adoption certificates signed by our principal. We learn our tree's scientific name and give it a friendly name.

In art we start a "baby-book" for our adopted tree.

APRIL: We share our trees with others by having "reading parties" with first and third graders. We write to our "pencil-pals" at another school and tell them about our adopted tree, comparing its bark to our skin, its sap to our blood, its leaves to our hair, etc. (ideas from **Project Learning Tree**).

We visit our city hall and park and see trees planted by the city. We will ask them to plant more and to remove one dead one. We plant seeds and watch them grow. (We see it takes a tree seed much longer to grow than a bean seed.) We do pamphlets entitled, **Auntie Pollution; There Lived A Wicked Dragon; A World Fit for Chipmunks and Other Living Things.** (These are free from U.S. Environmental Protection Agency.)

MAY: We read Dr. Seuss' book **The Lorax**, that tells us the sad plight of a world without trees.

We take an extended three days, one night, study to an island. There we meet many "cousins" to our adopted trees. There we see how trees are necessary in the entire web of life.

Summer

a season of adventure

BGronewald '80

From issue #14/15, Summer 1980. Art by Barbara Gronewald

Summer

a season of adventure

Outside the kitchen window this morning our bird feeder was visited by several new friends. Nine red-capped house finches, seven yellow evening grosbeaks and one bluejay. The window became the pallette for summer's artwork, starting with the primary colors from which all the rest of the summer's colors could be created, combining these birds in every possible way to bring the earth to its full pageant.

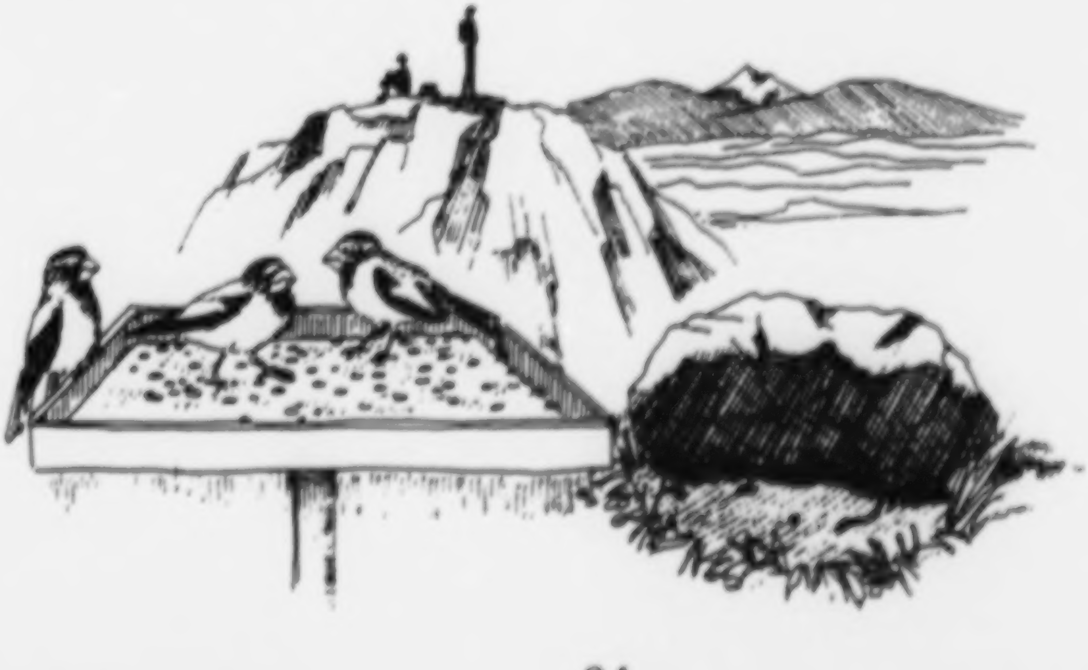
To me, color is the essence of summer. Not color changing like in autumn, but color being born. Walking in the garden yesterday, I noticed how all the plants that, as sprouts, had been the same light green color, were now becoming their own unique shade. Spinach becoming dark green, lettuce staying light, beets with red veins on green leaf, and each young plant with its own distinct and strong taste for my tongue. Summer being also the time for us to taste the world around us, I wonder what tastes correspond to the primary colors? or what sounds? or what smells?

Summer, if we open along with the season, is the time to taste, smell, see, touch and hear the natural world and through our sense to let nature become a part of us, nourish us.

As a part of this each summer, I make a few vows to myself. I will taste two new plants, look at new flowers, listen quietly to birds and bees at least a couple of times, smell a few new smells, learn by feeling, with my eyes closed, a new texture or two, swim in one new river. Then when I come back to teach in the fall, the year is new, has new challenges because I am new.

Summer is another adventure, too. Walking along the stream bank the other day, immersing myself in the sights and sounds, I came upon a large rock just right to sit upon. In any other season I would have sat and watched the river go by, listened to the stream and birds. But summer's journey is so full of life that even this stone came alive. With all my strength I pushed the rock and turned it over. What I found underneath was a whole new world, from a centipede to tiniest crayfish to a beetle living in a cool, moist home hidden from view. So, inasmuch as winter is a time for sitting on stones and resting on logs, summer is the time for turning them over to get at the life underneath. And each stone or log overturned is a new adventure, a new smell, a new taste of this life. In these hidden places we can find subtle life and learn to see the landscape in a new way. Bugs in the cracks of bark on the Douglas fir. The tiniest flowers sprouting from moss on forest rocks. The smell of the ground after a hard rain.

But there is one other way I have learned to taste summer's freedom outside the classroom. Last July we hiked to the top of the Middle Sister in the Central Oregon Cascades. Looking out with head in the clouds there was feeling not unlike the experience of lifting the river stone. Again, the top of the mountain is adventure tasting the landscape in a new way. The parts are larger, but the learning the same. How can we taste a piece of land 50 miles square or 1 inch square? Turn over a rock. Climb a mountain. Summer's the time to do both.



Energy Education
in Oregon Schools

This article is an attempt to provide an overall view of the state of energy education in Oregon. It is full of ideas and projects that have been successful, that can be models to others interested in energy, and it provides information about programs, services and resources that people can easily access. But most importantly, this article is the beginning of a regular section in CLEARING that is a forum for people throughout the state to share ideas, projects and concerns about energy education.

A Case for Conservation

by Mike Sould

"There is no energy crisis," my good friend keeps telling me. "You see," he says, "when I get tired, I just sit down and relax to conserve my energy."

"You miss the whole point," I tell him. "What about when the oil runs out and you can't heat your house or (like millions of others) drive your car."

"We could all walk to work," he says, "and I could tear down the garage to burn for heat."

I find myself in conversations like this quite often, and confusing as they are, I couldn't get hold of where communications broke down until recently when I visited my friend Meg in her classroom.

"Let's talk about energy," she said to her 30 fourth graders. "Does anyone know what energy is? Half the group was eager with answers. "Solar energy...nuclear...oil... electricity ...the sun!" Very good she told them.

"And does anyone know what energy conservation is?" "Turning off lights when not in use... insulation" came the answers. "Shower instead of bath ...carpooling."

"Fine," she returned, "and does anyone know what the energy crisis is?" No one raised their hand. She prodded further. "When we run out of enough energy to do things" someone finally said.

Something clicked inside me right then. I asked myself "How can we ever run out of our energy?" I always defined energy to be our ability to do something, so it sounded silly that we might ever run out of our ability to do things.

One of the major problems these days is the widespread use of the word energy. It is being used more and more to mean just electricity, fossil fuels or windmills and solar panels. But the whole concept of energy goes far beyond these. Energy from the sun, to our food, to our muscles, is involved in everything we are and do. Therefore, it is important that we clarify the word energy whenever we use it.

There is no argument about the energy crisis in terms of shortages and misallocations of natural resources that we use and depend upon as fuels for our house, cars, and businesses. This crisis is not really a matter of fuel but is more a matter of our building our lifestyles to become dependent upon the continuous supply of fuels we have. As long as we continue to depend upon the everlasting supply of oil, natural gas, and electricity, we will continue to have shortages. Certainly, these fuels are integral parts of our lives, but the evidence of their availability in the future and our increasing dependence upon them in the present, paints a dim picture. But to me, the availability of natural resources as fuels is not the most important issue here.

"The energy we use is a very personal thing..."

In Meg's classroom, no one mentioned food as energy, or anything emotional as perhaps a source of energy. Most all talk centered around natural resources used by the utilities and oil companies to provide us with heat and electricity and transportation.

None of Meg's students related to energy in any personal way, besides the few ingrained messages about energy conservation in the home picked up from their utilities and the media. No one mentioned growing their own food, recycling, or just sitting in a chair when they got tired. Yet each of these is a simple and natural way to use of "energy" wisely.

It was evident from this that perhaps there really is an energy crisis these days, not from lack of energy but from a view of energy in terms far removed from people personally.

The energy we use is a very personal thing, and our becoming aware of it is valuable in helping us to get more in touch with the world around us. For when we begin to understand how we use energy and fuels, then we can begin to change our decisions to ones that use energy and fuels more wisely.

This to me is what energy conservation really means. The wisest possible use of our resources. I cannot believe that anyone ever thought waste was reasonable. And yet much of our life involves wasting our most precious resources. One fine example is garbage. Garbage wastes natural resources including paper, metals, natural gas (plastics) and precious land when it is thrown away. And in terms of fuels, the amount of electricity waste represented by one bucket of garbage is enormous.

It is these sorts of actions that continue to make me believe that there really is an energy crisis, one that allows us to believe that energy conservation, or wisest possible use of our resources, is "not that important in the total energy picture." Personally using our resources wisely is the key to the entire energy puzzle.

With our limited supplies of fuels and electricity today, conserving energy through wise use will require us to depend more upon simplifying our lifestyles and adapting some of our present ways.

Necessarily, with our limited supplies of fuels and electricity today, conserving energy through wise use will require us to depend more upon simplifying our lifestyles and adapting some of our present ways. But I believe it is best that we begin now with our wisest choices instead of letting our present uses lead us into much more severe crises in the future.

Learning and teaching these concepts are not easy. But there are two approaches that I found the best in helping build an understanding of these energy concepts.

The first involves investigating and identifying the energy profile of the world around you. A good exercise for this is to take a chair or any other object from the classroom, living room, or wherever you are. Explore all the different kinds of natural resources, time, and energy that went into making it and getting it where it is. (A fun exercise is to draw, paint, dramatize or chart out the natural resources and process they went through to make the object.)

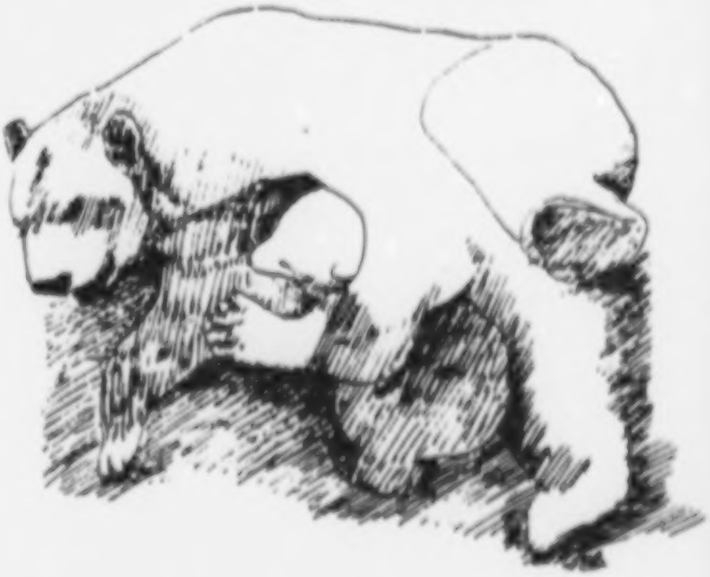
A piece of fruit helps us understand energy and resources in agriculture, transportation, marketing, and numerous other areas. And, now if we understand the object, we can make some reasonable decision about whether there is a wise alternative.

This process can open a whole new world to help us in all decisions about our choices for this or that. This approach also brings the energy picture to focus right where it is the most meaningful to us, in our relationship with the things around us. Getting more in touch with energy around us helps considerably in putting the larger scale pictures together more clearly.

The second approach involves looking at nature, for nature provides us with perfect examples of strategies for wisest use of resources. Animals survive on their ability to adapt themselves to their environment. We are the only animal that has the ability to change our environments to suit us. On a small scale, we can be very successful in adapting the land and resources to our needs. But we have reached the point now, that we are interacting with nature on a global scale. And we have found that there is a limit to the amount that we can continue to adapt the earth.

We have reached a point where we must learn, in order to survive, to adapt ourselves to the resources and processes that are available to sustain our lives. Therefore, this is the time when we can learn the most from nature.

Consider a bear. By studying the way in which a bear uses his resources to survive, we can learn wonderful lessons about recycling, resting, and keeping warm. Birds provide us with great lessons about insulation, and various means of energy conservation. And these lessons help us understand the most basic concepts of food and eating, warmth and housing, and travel. In teaching and learning about energy there are millions of lessons we can find from nature.



These two approaches then are two very valuable ways of learning about the energy picture and developing a good understanding of the use of resources and energy in our lives. As energy education progresses, I believe that these two processes—exploring the world that surrounds us closely and looking to nature—can help provide us with the perspective on energy necessary to help us use our resources in the wisest way. For if we use our resources wisely enough, we can have no crises.

ENERGY WEEK

The Key is Involvement

I am always delighted and amazed working with schools doing energy weeks at how one small spark of enthusiasm can light so many people, can really get them excited about working together.

From the students and teachers, to the principal, custodian, secretary and cook, everyone finds some way to become involved, gets excited about both learning and really doing something concrete about energy in our lives.

But most of all, it is heartwarming to see the people thing. How working toward a common goal helps build a whole new set of relationships in the school that we can see continue and grow all year.

Steps for Planning a School Wide Energy Program This Year.

by Kathy Norris

In order to stimulate the student to higher cognitive thinking levels, the learner must be actively involved in the learning situation. The key to a successful Energy Week is involvement.

Organizing Strands:

STRAND ONE: Where do you begin?

Dig up your enthusiasm, gather a few concerned educators, develop a school Energy Council and the outcome will be limitless! Energy councils have come into existence in many schools in response to the steady increase of energy concerns of students, teachers and community.

Once there is some commitment to the idea of an energy week, the rest usually falls into place. We've found that it helps to introduce the idea and outline some of its possibilities at a faculty meeting, or if you already have an energy council, start there.

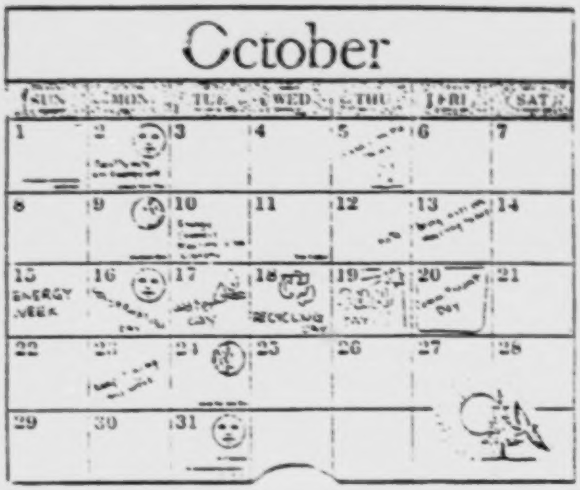
We have a slide show we use to help teachers get excited and to open them to the opportunities that exist in doing a week like this.

Once the enthusiasm is there, the real first step is to decide upon an energy conservation-oriented theme or topic for the Energy Week, with a special focus for each day of the week. These topics will be the vehicles for promoting energy awareness and literacy to the school and community throughout the week.

One school, in Beaverton, Oregon, chose the following themes for their week:

Monday: Conservation of Paper Day
Tuesday: Conservation of Fuel Day
Wednesday: Conservation of Water Day
Thursday: Conservation of Food Day
Friday: Recycling Day

Some other ideas include: Sun Day, Approrpiate Technology Day, Energy Issues Day, etc.



STRAND TWO: Special Events

Once the format has been established, your next objective must be to plan events and activities for each specific day. For example, if one of your chosen days is "Recycling Day," you might plan to have the entire school become involved in recycling the paper that they would normally have thrown away that day. This is something everyone can become involved with. Below is a sample weekly schedule of activities:

Monday: Fuel Day
a. Teachers will carpool.
b. OMSI's "Energy Suitcase" will make presentations to individual classrooms.
c. PGE will be here to set up their "Watt Watcher's display and to bring their films and kits for our use.
d. All students will tour the building's energy sources!
Tuesday: Recycling Day
a. OMSI will complete their suitcase presentations.
b. Portland Recycling will make a presentation to all students.
c. The "Energy Council" will make individual presentations to all primary students using E.M.E. materials. They will contact you.
Wednesday: Pollution Day
a. Dyas Rawlings will be here to make a presentation titled, "Save Our Streams" (Grades 1-3 . . . in individual rooms) (Grades 4-6 . . . meet in library)
b. The "Energy Council" will make simulator presentations.
Thursday: Food Day
a. An "Energy-less" meal will be served in the cafeteria. Parents are invited. (A menu and invitation will be sent out shortly.)
b. "Simulations for Citizens" will begin after lunch. The Energy Council will present the simulator for the parents that attend the lunch.
Friday: Commitment Day
a. Simulator presentations will conclude.
b. The council will collect each room's special commitment. (The students should write their own commitment to our "fruitful planet." Discuss what they can do as a class to keep "Energy" awareness for more than a one week affair.)

Teaching Aids for the Week

a. An "Energy Center" for listening and viewing of energy kits will be set up in the library.
b. A "Teacher's Energy File" for each special day of the week will be found in the faculty room.
c. The Energy and Man's Environment materials are here!
d. An "Energy Showcase" will be available for your class to visit. It will contain activities for you to do right on the spot!
e. Numerous kits and films have been ordered for your use.
f. The "Energy Council" will be available to help with special projects. They have numerous ideas and loads of enthusiasm.
g. The video-tape will be here to catch special events.

STRAND THREE: Everyone's Involved!

In planning this week's activities, make sure to contact the cooks, parents, custodians, librarians and anyone else who might like to participate in the week's events. The result a wealth of ideas and a bringing together of the total staff in a common goal. It feels good and is successful.

Here are a few ideas:

Librarian: You might consider working with the librarian to set up an "Energy Center" in the library that would feature for use, current energy education media.

Custodian: Have the custodian conduct tours through the school's energy sources.

Cooking Staff: Meet with the staff to discuss their preparation of a lunch that would utilize little energy to prepare. In addition, why not discuss the possibility of charting "food waste" during Energy Week.

Activities to choose from for: Conservation of Paper, Recycling Day

1. Weigh paper inclassroom garbage can on an unannounced day. Then, discuss "recycling of paper" and try to reduce trash. Weigh again on another day. Any improvements?
2. Give awards to those students who use their paper efficiently.
3. Chart, with class, "good" uses of paper and "bad" usage of paper.
4. Discuss organizing a PAPER DRIVE!
5. Go for a whole day doing assignments of "reusable paper."
6. Make posters that encourage using both sides of paper in the classroom. (The posters could be made out of recycled paper!)
7. Participate in recycled art projects. Invite a parent to join you in the planning of this.
8. Decorate a box for "recycling" in your classroom.
9. Decorate a box for "reusable" paper in your classroom.
10. Plan a class project to "Fight Litter." (Go on a school litter hunt.)
11. Award someone as "Cleanup champ" of the week.
12. Discuss "packaging" of items. Is it at all wasteful? Describe their impact on our energy reserves and identify ways of eliminating this energy waste. You may wish to take a field trip to your local supermarket.

STRAND FOUR: Resources

Outside resources will enhance and bring excitement to the week's activities. The realm of agencies and experts available to contact is almost infinite! You will find them most anxious to serve your needs, as well as, a fruitful addition to your week. The following is just a small list of the possible contacts.

Kathy Norris
Portland General Electric
121 S.W. Salmon
Portland, OR 97201
226-8333

Al Hughes
S. Willamette Energy Action Team
Eugene Water and Electric Board
500 E. 4th Ave.
P.O. Box 10148
Eugene, OR 97440
484-2411

Energy and Man's Environment
7874 S.W. Nimbus Road
Beaverton, OR 97005
641-9043

also
Local Energy Extension Agent
Local Utility or Power Company
Local conservative groups

Dick Donin
Energy Studies Center
3400 S.E. 26th
Portland, OR 97202
236-2601

Energy Management Program
North Clackamas School District
14211 S.E. Johnson Rd.
Milwaukie, OR 97222
653-3643

Energy Year

I recently spoke with a teacher friend who organized a successful energy week in her school two years ago. "Are you planning another energy week for this year?" I asked her. "Energy Week?" she asked. "Every week is energy week at my school now." She went on to tell me how her students have been able to maintain their high level of enthusiasm all this time. "They just enjoy having something meaningful to work on together," she told me. "It's not pretend, the energy situation is very real and the students like being involved, 'doing their part.'" The key, she said, is maintaining an active Energy Council. Just "continuing to do real activities that help produce visible results by conserving."

If you find yourself interested in extending your energy week, pick up these resources that are very helpful tools for developing appropriate themes and activities. You may need to dig a little to find them but they are still floating around and well worth the time you spend locating them.

Energy Watch Calendars 1976 and 1977
published by Oregon Dept. of Energy, 528 Cottage St., N.E., Salem OR 97310
and [illegible]
Sun Day Energy Watch Calendar for 1978
published by Western [illegible] Council and Washington Dept. of Energy, 400 E. Union Ave., Olympia, WA 98504
(We also know that the [illegible] version was compiled but never published. Perhaps you can find a draft of that one somewhere, like the Washington Department of Energy.)

STRAND FIVE: Audio-Visual Materials — a necessary element.

In preparation for the week, spend some time at your district's curriculum center ordering kits, films, models and filmstrips appropriate to your topics for the week. Compile a list describing the items you chose and denote the dates and times available for viewing. The teachers will then be able to see what is available and sign-up for the materials of their choice.

During one week, we set up an entire resource matrix board so teachers could choose the resources they wanted at specific times.

STRAND SIX: Teacher's Energy File

Make a file for each day of "Energy Week." As you, and others begin to gather information and project ideas, place them into the appropriate file. Place this in a convenient spot for use by teachers. Perhaps in an "Energy Center" in the library! You'll find that with any effort the material will accumulate quite fast.

School Energy Council

Many of the schools we have worked with have existing or newly formed energy councils that have taken most of the responsibility for organizing and conducting an energy week. The rest of the schools usually start a council as a result of the week. Energy Councils have come about as a school's response to the steadily increasing concern by students, teachers and the community about the energy situation. The councils generally meet twice a month and consist of teacher representatives, and students from each grade level who are willing to become members. In some schools, requirements for membership include:

1. *Interest in conservation and saving our earth!*
2. *The prospective member must be able to demonstrate self-control in a meeting situation.*
3. *The students must be working hard at all classroom tasks.*
4. *They must be interested in becoming actively involved in energy-related projects.*

The main focus of the council is to plan activities throughout the year that help the school and community become informed on current energy issues, concerns and conservation strategies. The main project of the council usually is the energy week.

In some schools, the energy council is a subgroup within the regular student government body. We always encourage the council in its early stage to establish its identity through visible projects and the development of letterhead, other graphics, or even buttons.

Some successful council projects in the past have been:

1. Teaching recycling art projects to young children
2. Sponsor paper drives
3. Research energy-related topics
4. Coordinate a monthly speakers forum
5. Design t-shirts on recycling
6. Co-ordinate the "Energy Showcase"
7. Make plans for an "Energy Happening" each month
8. Present project ideas at teacher's meeting
9. Sponsor poster contests
10. Start a school garden
11. Classroom presentation (skits, talks, etc.)
12. Build a solar cooker
13. Organize a parents Energy Night
14. Write songs on energy
15. Teach younger children how to write "Energy Haikus"

STRAND SEVEN: Energy Theater

Whenever possible, we've tried to set aside one room to serve as the center of the weeks activities. This room housed the simulato and any exhibits provided by outside resources. Teachers then brought their classes to this "Theater" to participate in simulator presentations, special films, orguest presentations, and also to view the various exhibits.

STRAND EIGHT: The Energy-Environment Simulator

This excellent tool is not available everywhere but is a strong component in many programs. It can be used to explore interrelationships in energy supply, demand, growth, use and depletion. If you can locate one, plan to train teachers, as well as the "Energy Council," to use it.

Have a sign-up sheet available for teachers to note the time they would like their students to participate in simulator "happenings."

STRAND NINE: Energy Showcase

Decide upon a showcase or a central bulletin board that will be utilized to advertise "Energy Week." Then, during the week, use it to denote that day's theme or topic. Grade levels could sign up for the day of their choice and then plan a suitable display. Get everyone involved!!!

It is fun for a class to come to the display and actually do something, like bringing their recycled paper, reading meters there, or turning hand crank generators to learn about resistance and "loading."

STRAND TEN: Involve the Community

Let the community know about your efforts! One way to do this is to contact local newspapers, T.V. and radio stations. Have their articles include an invitation to the public to view the displays and exhibits and participate in the week's events.

We've always found it effective to have the parents become involved in the activities of the week by having students do home surveys and conservation activities. Often, schools plan a special afternoon when parents are invited in to see displays, exhibits and special presentations by students.

STRAND ELEVEN: ENJOY!

As you participate in this common project, you will find the total staff and students developing a very special rapport.

new relationships will arise and a harmonious feeling will prevail. Enjoy!!

Kathy Norris is an energy education specialist with Portland General Electric, taught in Beaverton schools seven years, has been the state coordinator for Energy and Man's Environment and works with schools throughout the nation developing Energy Weeks.

She has a slide program on how to do an energy week she will bring to your school. 30 minutes for faculty meeting. ☐

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THE WIND

"The wind blows south
the wind blows north
round and round it goes
and returns full circle."
—ecclesiastes

WIND POWER

For centuries, power from the wind has been used to pump water for crop irrigation, to propel sailing ships across the oceans, and to turn millstones to grind flour from grain. From its origins in Persia in the 7th century, the windmill concept spread throughout the Islamic world and reached Iran and China by the time of the Mongol conquests. In the 11th century, windmills appeared on the farms of western Europe and, by the 17th century, the Netherlands had become the world's most industrialized nation by extensive use of wind power to drive trading ships, to power grinding mills, and to pump water from lands that were once beneath the sea.

Over the centuries, the original windmill design was refined and improved. By 1850, use of windmills in America to pump water and turn sawmills represented 1.4 billion horsepower-hours-of-work, an amount equivalent to 11.83 million tons of coal.

This growth was curtailed somewhat by the introduction of the steam engine, but interest picked up again as settlers moved out into the American West and Great Plains areas. By 1900, a large windmill industry existed in the United States with a capital investment of over $4 million. By the 1920's, wind power had become a major source of electrical power on farms and homesteads across the United States. Similar developments took place in Europe. These small-scale generators served well for years, providing cheap, clean electrical power to thousands of rural and farm homes. However, the establishment of the Rural Electrical Administration (REA) in 1930 made federally-subsidized, centrally-generated electrical power available to farms. Installation of all the cables took about twenty years, but by 1950, small-scale windmills were a thing of the past.

Interest remained in the potential of large-scale wind generators, however, and between 1935 and 1955 a number of machines, ranging in power from 90 kw to 1.25 Mw, were built. One of the largest and most well-known, the 1.25 Mw Smith-Putnam generator, was built on "Grandpa's Knob" in the mountains of central Vermont. While the success of that experiment was short-lived, due to mechanical failure and the complications and expense of war-time materials supply, it did demonstrate the feasibility of capturing wind power for electrical generation on a large scale.

SIGNS OF WIND

- Soft, vapory, and widely extended redness in the east in the early morning means wind.
- If, just before the sun rises, there appears at the point of rising a rosy column shooting straight upward like a shaft of deeply dyed vapor, and if the base of the column glows like the sun itself, be prepared for a very windy day.
- Clouds that look like a horse's tail when it is running mean strong winds.
- Sharp horns on the moon foretell strong winds.
- North wind brings cooler weather; south wind brings warmer weather.
- Expect wind in the morning when an evening sky is yellow.
- A high dawn, look for wind. (A "high dawn" occurs when the first indications of daylight are seen above a bank of clouds.)
- "When the wind veers against the sun,
  Trust it not, for back 'twill run."
- "Mackerel sky and mare's tails,
  Make lofty ships carry low sails."
- "If clouds look as if scratched by a hen,
  Get ready to reef your topsails then."
- "When the wind is in the South
  The rain is in it's mouth,
  When the wind is in the East
  It's neither good for man nor beast,
  The wind in the West
  Suits everyone best."

"It's a warm wind, the west wind, full of birds cries.
I never hear the westwind but tears are in my eyes
For it comes from the west lands, the old brown hills.
And April's in the west wind, and daffodils."
—john masefield

Measuring the wind

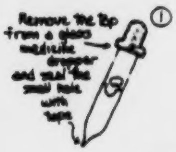
Beaufort Wind Scale

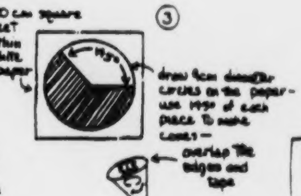
Beaufort number	Description	Observation
0	calm (0-1 mph)	smoke rises vertically
1	light air (2-3 mph)	smoke drifts slowly
2	slight breeze (4-7 mph)	leaves rustle, windvane moves
3	gentle breeze (8-12 mph)	Twigs move; flags extended
4	moderate breeze (13-18 mph)	branches move, dust and paper rise
5	fresh breeze (19-24 mph)	small Trees sway
6	strong breeze (25-31 mph)	large branches sway, wires whistle
7	moderate gale (32-38 mph)	Trees in motion, walking difficult
8	fresh gale (39-46 mph)	Twigs break off Trees
9	strong gale (47-54 mph)	branches break, roofs damaged
10	whole gale (55-63 mph)	Trees snap, damage evident
11	storm (64-72 mph)	widespread damage
12	hurricane (73-84 mph)	extreme damage KABOOM!

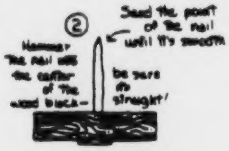
MATERIALS:

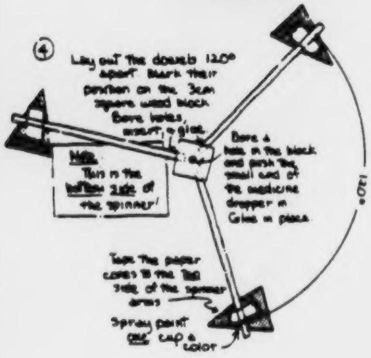
- 3 pieces wood dowel, 3/16" diameter x 15cm long
- 1 wood block, about 12cm square x 3/4" thick
- 1 16-penny nail; hammer; sandpaper
- Glass medicine dropper
- 1 balsa block, 3cm square x 1/2" thick
- 3 sheets thin white paper, 10cm square
- Glue; tape; protractor
- Teachers should use! Hobby knife or pocket knife ← narrow blade!
- Scissors; spray paint, any color ← red, blue, or black is best!

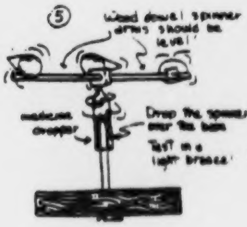
Build an anemometer ← a device used To measure wind speed! like this:


①
Remove the Top from a glass medicine dropper and seal the small hole with tape


③
10 cm square sheet thin white paper
draw 9cm diameter circles on the paper - use 1/3 of each piece To make cones -
overlap The edges and tape
120°


②
Hammer The nail into the center of The wood block -
Sand the point of The nail until it's smooth
be sure it's straight!

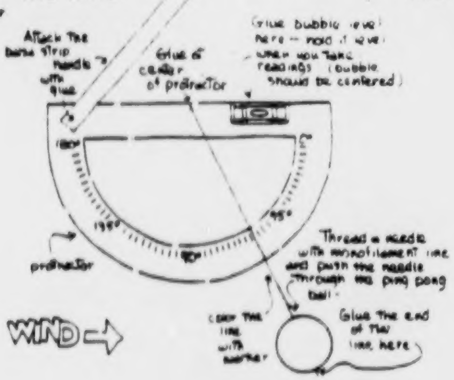

④
Lay out The dowels 120° apart. Mark their position on the 3cm square wood block. Bore holes, insert & glue.
Note: This is the bottom side of the spinner!
Bore a hole in the block and push The small end of the medicine dropper in. Glue in place.
120°
Tape The paper cones To the Top side of the spinner arms
Spray paint one cup a color


⑤
Wood dowel spinner arms should be level!
medicine dropper
Drop The spinner over the nail.
Test in a light breeze!

MATERIALS:

- 1 ping pong ball
- 1 piece fishline ← (.08"-.02" diameter monofilament nylon line, 30 cm long - Try a fishing/bait shop or sporting goods store)
- Protractor; red magic marker
- 1 strip balsa, about 1/2cm square x about 18cm long
- 1 bubble level ← The kind with an air bubble inside - Try a local hardware store)
- Glue; needle ← (long enough To go Through The ping pong ball)

Build a device to measure the wind

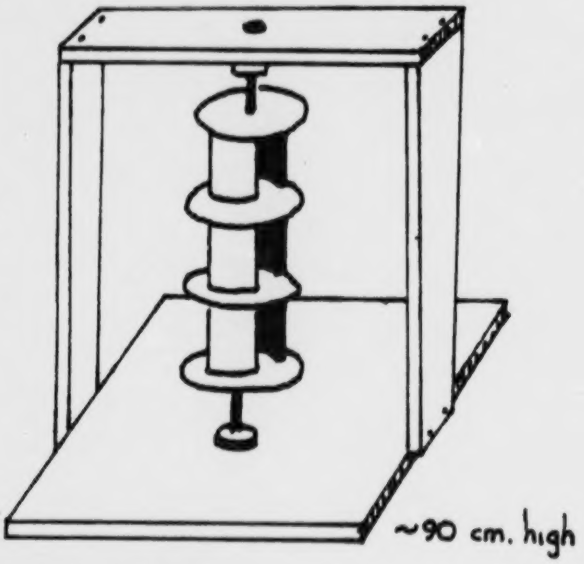

Attach The balsa strip handle To with glue
Glue at center of protractor
Glue bubble level here - hold it level when you Take readings (bubble should be centered)
180°
135°
90°
45°
protractor
Thread a needle with monofilament line and push the needle Through the ping pong ball
Color The line with marker
Glue The end of The line here
WIND

Calibrate the wind speed like this

angle	mph*
90	0
85	5.8
80	8.2
75	10.
70	11.8
65	13.4
60	14.9
55	16.4
50	18.2
45	19.6
40	21.4
35	23.4
30	258
25	28.7
20	32.5

* miles per hour

A Classroom Savonius Windmill



William G. Hoffman
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Introduction

The Savonius or S-rotor windmill was introduced to the United States in 1924. The powershaft is located in the vertical plane rather than horizontally as in the traditional bladed windmill. This has several benefits. The windmill does not need a wind direction seeking vane since it doesn't matter from which direction the wind is blowing. Also, power is available at the base of the mill rather than at the top of the tower. The Savonius mill is also less easily damaged by high winds than the traditional windmill.

A simplified Savonius windmill may be constructed for your classroom without too much difficulty. The model is approximately 3 feet tall which makes it portable and easy to store and yet it is large enough to actually generate electricity when coupled with a small permanent magnet electric motor operated as a generator.

Materials

To construct the model, you will need the following materials:

1. 3 two-pound coffee cans or the equivalent
2. ¼ inch diameter threaded rod 3 feet long
3. 6¼ inch diameter nuts
4. 2 roller skate wheels with a ¼ inch inside diameter
5. Scrap masonite or thin plywood for end caps
6. Scrap pine lumber or plywood for the support frame
7. Epoxy cement

Obtain all of the materials before you begin construction. You may find it necessary to make substitutions in materials and/or dimensions. Plan ahead and you won't get any unexpected surprises.

procedure

1. Cut both ends out of three coffee cans. Carefully cut the cans in half lengthwise so that you end up with two equal sized trough-shaped pieces from each can. Cover the sharp edges with adhesive tape to lessen the possibility of a cut.
2. Next fabricate the four end caps of thin plywood or masonite, 1/8" or 1/4" thick will be adequate. The diameter of the end caps should be twice the diameter of the cans you used plus 1". These end caps should be round and must have a 1/4" diameter hole drilled in the center of each end cap with a pencil to assist you in positioning the rotor blades on the end caps.
3. Assemble two can halves to an end cap in the following manner to form a rotor subassembly. Use epoxy cement mixed in accordance with the package instructions to glue the rotor blades in place (Fig. 1)
4. Make a total of three rotor subassemblies as shown in step 3.
5. Join the three rotor subassemblies and the fourth end cap as shown in Fig. 2 by passing the 3 foot threaded rod through the center hole of each end cap. Make sure that the center line of each end cap is oriented 60° away from the one below it. Epoxy each rotor subassembly and the fourth end cap to the one next to it and tighten the 1/4" nuts to hold everything together until the epoxy cement dries.
6. Install the bearings (roller skate wheels) in the following manner: Use a 1/4" nut at each end of the bearing to hold it in place and lock it to the motor shaft. Tighten the nuts snugly (Fig. 3)
   Epoxy the outer races (surfaces) of the bearings to the base and upper support. Make sure that the rotor is free to turn. you may have to remove some material from the base and upper support by drilling to allow clearance for the inner race of the bearing and ¼" nuts on the end of the threaded rod.

Conclusion

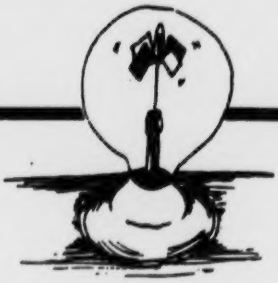
Take your masterpiece outside on a breezy day and see how well it works. If you are satisfied with its performance, you may attach a small 1½ volt DC permanent magnet motor to the shaft by using pulleys and elastic band belts. When the motor is spun fast enough it will generate enough electricity to light a 1½ volt light bulb.

Light and Solar Energy — The Radiometer

Purpose:
To see if distance from a light source makes any difference in the rate of rotation. To discover why a radiometer turns.

Objectives:
The student will be able to demonstrate and explain the effect of distance (from a light source) on the radiometer's rate of rotation. The student will be able to state what makes a radiometer turn (not necessarily why!!).

Materials:
1. Radiometer (one per lab team).
2. Light source (150w) (one per lab team).
3. Opaque sheet of paper.
4. Bucket of hot water (or hot water source).
5. Paper towels.



Procedure:

Part I
1. Take a radiometer and place it so that sunlight or strong artificial light strikes it. Observe and record what happens.
2. Place a piece of opaque paper between the radiometer and the sun. Observe and record what happens.
3. Write a brief statement telling how or why the radiometer blades turn.

Part II
1. Place a light source and a radiometer on a table two meters apart. Observe what happens. Make a ten second count of the number of complete rotations your blades make. Repeat your count. Record both counts and an average of the counts in a data table.
2. Move the radiometer to one meter. Make two ten-second counts and record this data. Compute the average number of revolutions and record this figure.
3. Move the radiometer to 50 centimeters and make two ten-second counts and record this data. Compute the average number of revolutions and record this figure.
4. If you can make or accurately estimate your ten-second counts move the radiometer so that it is 25 cm and 12.5 cm from the light source. Again take two readings, compute the average, and record all three figures in your data table.
5. Graph the averages.

Part III
1. Work in a tray or in an area unaffected by water.
2. Place paper towels soaked in hot water all around the radiometer. Leave a small hole to see through. Record what you see.
3. Remove the hot towels. Record what happens.

Questions:

Part I
1. When you first saw the radiometer turn, did you think that it was light that caused the blades to turn?

Part II
1. How does the distance from a light source affect the number turns in the radiometer.
2. Play with your numbers and see if you can detect a pattern in the amount the number of turns increase, as the distance is cut in half each time. (Hint: think about squares)

Part III
1. What really causes the radiometer to turn?

Teacher's Note:

In seven years of Junior High School science teaching two things have influenced the birth of this laboratory experiment in radiometer basics. The first was my continual shuffling of these clever little devices from shelf to shelf in my storeroom with absolutely no way to use them. The second was the fascination with which children view and play with radiometers.

These two factors coupled with my desire to both have students understand experimentally what actually causes the radiometer to rotate and to conceptually approach the inverse square relationship between light intensity and distance experimentally, motivated me to write "Radiometer Basics." Hopefully this experiment will allow some of you to use your surplus radiometers, have fun, and let students learn a little about the nature of light.

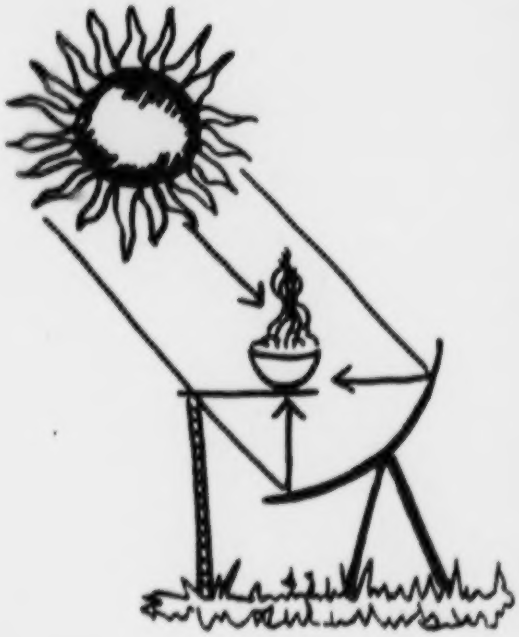
Ron Fullerton,
Oregon Energy Education Network Graduate Assistant.

Energy

A Solar Cooker

A SOLAR COOKER YOU CAN MAKE AT SCHOOL
You Will Need:
4 sheets of thick cardboard - 4' x 4'
2 sheets of poster board
A piece of plywood 18'' x 24''
A 3/4'' mounting flange
2 pieces of 3/4'' tubing, preferably aluminum, one 40'' and one 24''
A telescoping curtain rod, 36'' and about 1/2'' diameter
1 broomstick - 4' long
1 foot of clothesline
3/16'' x 1'' bolt with a wingnut
A roll of aluminum foil
Cardboard scraps to make 16 1'' x 1'' squares
Airplane glue
Masking tape
A cheap wire picnic grill with a wire handle

The solar cooker may take some time to build, but the benefits are worth the effort. It is inexpensive, simple to construct, and will give a first-hand demonstration of solar concentration.



THE REFLECTOR

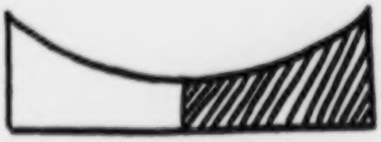
1. On a piece of cardboard draw a 48'' diameter circle, draw a line dividing the circle into quarters.

2. a. Using a large piece of cardboard, draw an arc of 36'' radius, starting one foot from the edge. Cut out a rib 4' x 1'. Using this as a pattern, draw and cut seven more ribs.

b. Notch two full ribs (see drawing) so that they fit over each other.

c. Glue the ribs perpendicular to each other on the base board using airplane glue. Cut the remaining ribs in half and space them equally between the full ribs, then glue these onto the baseboard.

d. Cover the outside edge of the circle with a cardboard wall of about one foot high.



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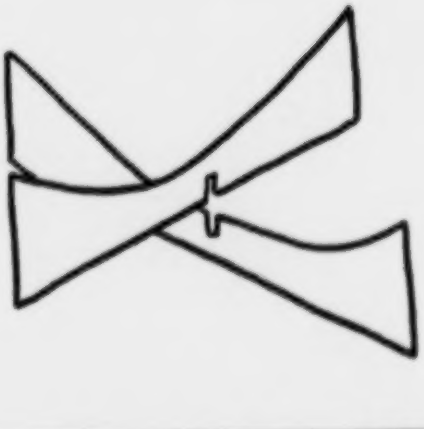
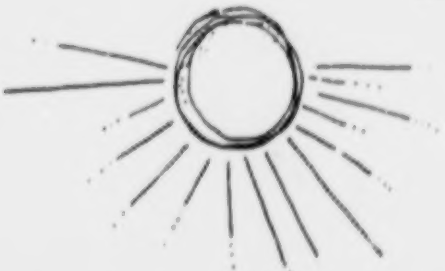




Energy

Solar Cooker

continued

e. As the ribs and the wall dry, cut pie-shaped wedges of poster paper to cover the face of the reflector. These should be about 1/4'' wider than the ribs, so that they overlap. You will need 16 wedges, so cut one and use it for a pattern for the remainder.

f. Glue the wedges over every other space, applying glue to the ribs and the wall. When these are dry, glue the remaining wedges over the alternate spaces, overlapping the wedges.

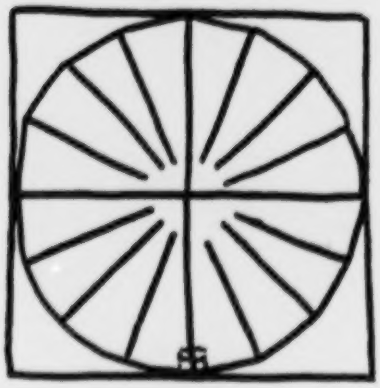
g. Cover all the edges with masking tape, including the wall.

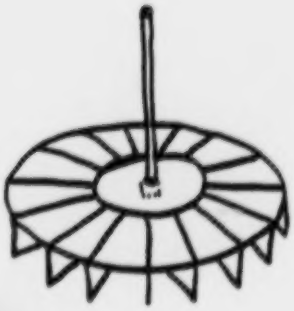
h. Cut out a 6'' circle of poster board and glue it to the center.

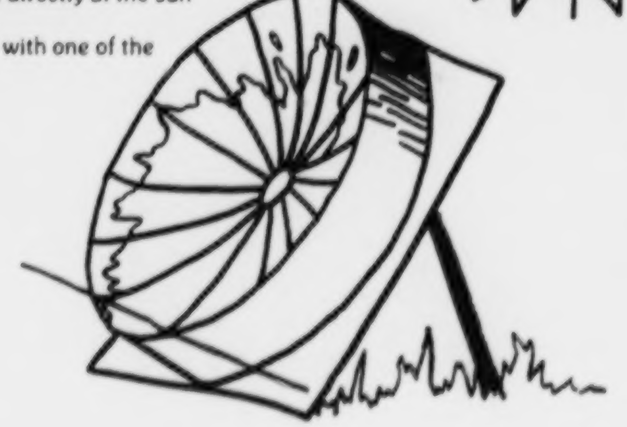
i. Cut 16 aluminum foil wedges, slightly bigger than the poster paper wedges. Using rubber cement carefully glue the aluminum wedges on, the shiny side up, trying to keep them smooth.

j. Drill a hole in the center of the reflector small enough to accept the large end of the curtain rod. Now point the reflector at the sun. When the rod throws no shadow on the face of the reflector, it is pointed directly at the sun and you have found the focal point.

3. To set up, prop the reflector up with one of the broomsticks.



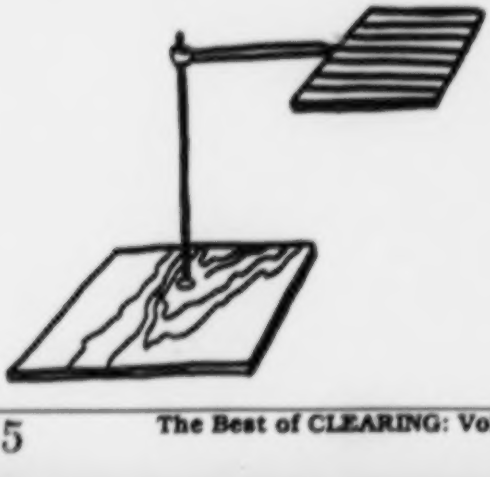




THE GRILL

4. To make the grill stand, take the plywood and fix the mounting flange in the center. This will accept your 40'' tubing. Take the 24'' piece of tubing and flatten one end, then shape the bent end into a circle. Drill a hole where the loop comes back on itself and slip in the bolt and wingnut. Now slip the circle over the other pipe, put the grill into the other end of the 24'' tube and flatten the tube onto it so that it stays in place.

To Cook, place the reflector in direct sunlight and line up the focal length, then move the grill into place at the end of the pointer. START COOKING! You can cook directly on the grill or in blackened frying pans (dripping grease won't hurt the reflector).



Activity

The Geologist's Dilemma

Time: 50 minutes

Procedures: Simulation Discussion

Concepts:

Scarcity
Opportunity
Resources
Interdependence
Incentive

Goals:

The Student
1 Knows that the actual remaining fossil fuel reserves is unknown
2 Knows that as fossil fuels become more difficult to find and retrieve the price will increase
3 Knows that price and the incentive to explore new fuel deposits are closely related.

Materials:

A large handful of very small beads at least four different colors, mixed with a large quantity of baby powder.

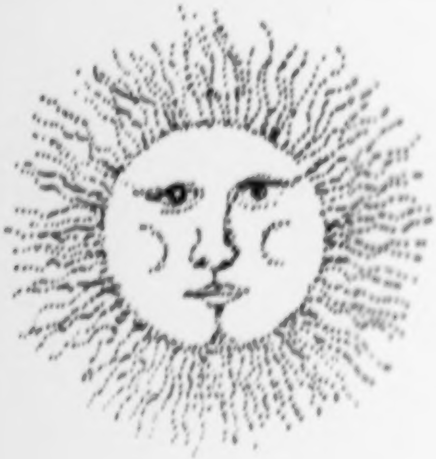
Directions:

1 Before students arrive in class, throw the handful of beads high in the air, hitting the ceiling.
2 Divide the class into five companies.
3 Each company will search for one color bead. The total number of beads should be broken down into the following proportions.
  Company I · black (coal) 50%
  company II · red (uranium) 3%
  Company III · white (natural gas) 10%
  Company IV · blue (oil) 37%
Company V · yellow
Powder · solar power
(if any company starts to gather all colors, do not interfere or comment.)
4 Explain that you have thrown an unknown quantity of beads, energy resourses, into the air. The total resources available represent those available in 1957.
5. The first search will last (1) one minute.
6 Start the search.
7 Stop in one minute.
8 Have each company count its resources.
9 Collect all resources recovered. (Keep in separate piles.)
10. Start a second search for one more minute. Each company must search for resources still missing. Do not throw the recovered beads back up. (They represent expended resources.) The year is 1967.
11 Stop the search after one minute. Have companies count resources. Collect recovered resources. (Keep in separate piles but close to piles from the first search.
12 Explain that the demand for energy has greatly increased therefore in the third search the time is reduced to 30 seconds to simulate the need for faster recovery of energy The year is 1977
13 Stop the search after 30 seconds Companies count resources Collect recovered resources – put them in a third series of piles close to the others.
14 Establish the winning company

Debriefing:

1 Looking at the three series of piles of energy, what generalizations can you make?
2 Why didn't any company collect the powder?
3 If you were selling the recovered resources, which would be most expensive? Explain
4 If you were to make one more search (representing 1987) and the "demand" was up but the "time was reduced to 20 seconds, what would happen to the price? Explain
5 If the price is higher, is it justified?
6 Would you feel that a greater profit, higher percentage, in 1987 might be justified? Explain.
7 As the resources become more difficult to find what other complications arise in addition to requiring more labor? (i.e., if some beads went into a light fixture or a radiator the companies whould require new capital, ladders, tools, etc.)
8 Was it (or would it be) reasonable for any one company to explore for several types of resources? Explain.
9. How many people would be willing to come back after school to recover your company's colored beads for one cent each? Explain.
  How many for 5 cents?
  How many for 25 cents?
10. How many would be willing to come back at 5 cents each with no restriction on color and you are the only one searching? (monopoly)
11. What would be your price for these resources?
12. How many resources remain?
13. Which basic knowledge expectations have we dealt with in this activity? (compare to basic expectation handout)

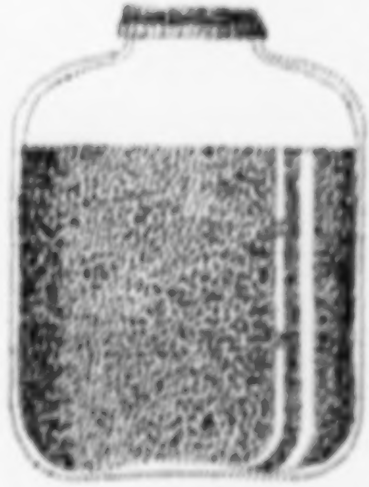
solitary vireo



Activity: Sun Tea

Solar energy grows our food and heats our homes, and it can also provide us the most clear and refreshing summer drink you can imagine. Making Sun Tea is an easy and dramatic way to show the sun at work. You will need a clear glass one-gallon container that has had all labels removed. An old cider jug or a big mayonnaise jar are your best choices. It will take two tea bags (choose a variety that brews dark) to make a good flavorful tea. Fill your container with cold water (the colder the better), and suspend the tea bags in the water with the strings hanging outside the jar.

Set the container outdoors in a place that will receive at least four hours of sunlight. Periodically check your sun tea, and watch as the water warms and the tea brews darker and darker. Bring it in the refrigerator when the tea has reached the strength you prefer, or serve it immediately over ice. You just can't buy, or prepare with boiled water, a more purely clear and refreshing iced tea than the tea you let the sun make for you.



Food and Energy

Food production and distribution costs are quickly rising, due primarily to the large amounts of energy required to fuel the U.S. food system. As energy becomes a more and more precious commodity, the impact on the U.S. food system will become much more serious. Production, processing, transportation, and distribution are all aspects of the food system that are heavily reliant on energy for their existence. As each step becomes more expensive, the compound effect on the final product — the food on your table, is enormous.

Along with prices, U.S. agricultural practices, heavily dependent on energy-intensive chemical fertilizers, have depleted the quality of the soil until what was once a rich, fertile substance capable of sustaining healthy food crops is now a barren, lifeless mixture of wind-blown dust and man-made chemical compounds.

A solution to the problem lies in the ability of individuals to see the larger picture of how our food comes to be on our table, and in doing so see the road leading to a solution. As long as we just think about our own little corner of the system, without seeing how everything fits together, we will continue to experience rising food prices at the grocery store.

Here are some questions, borrowed from Organic Gardening magazine (October, 1980), that will help you get in touch with some of the issues that need to be addressed if we are to avoid future food crises.

Where Does Your Food Come From?

Think of this question in an item-by-item way, as well as generally. How much comes from your garden, and how much do you buy? Try to get a handle on where they originate and whether you could get any of them from sources closer to your home.

How Much Does Your Family Eat In A Year?

The importance of food becomes more apparent when we get an idea of the quantity used over a period of time. The average American eats 1,451 pounds of food a year. Multiply that by 230 million people in the U.S. and you can see how important is the system that keeps food coming to us regularly.

Do You Know How Much You Produce In Your Garden?

Last year, according to a survey, 33 million American households (42%) grew some of their food in home or community gardens. With an average cost (for seeds, fertilizer, etc.) of only $19, the total savings was $367 for the typical family garden.

Do You Know How Much You Could Produce?

What would happen if you enlarged your garden, put in more time, or grew varieties that produce more in a smaller space? What percentage of your total food needs could you produce? What would be the impact on your budget?

What Is The Energy Cost Of Your Food?

Very little energy is needed to produce a potato in your garden or on a nearby farm. But a box of potato flakes requires nearly ten times as much energy to produce as the same amount of raw potatoes.

Do You Know Where The Nearest Farm Is, And What Food You Could Get From It?

Today, many farmers buy almost all their food in stores. Farming has become specialized, with even family farms producing only one or two crops, which are processed into food at distant locations. That single-cropping and specialization is a big cause of the vulnerability of our food system. Do you have any balanced, diversified farms near you? Can you buy local produce at roadside stands?

How Much Food Could Your Community Produce?

Much vacant land near towns and cities could be used for intensive food production if people saw the need. An inventory of local food-production potential is an important first step toward planning a food system which would operate with less reliance on high cost energy, and which could protect regions against inflation and shortages.

Who Is In Control Of Our Food System?

You are in control of the food grown in your garden, but food that you buy can be under the control of organizations or even countries you know little about. Consumers who know little about the control of their food supply can't do much to change things.

Does What You Eat Make A Difference?

Every vote counts at election time, and so do purchases at the food store. If more people switched to more fresh and healthful foods, the impact would be felt up and down the commercial food chain, and policy changes would result.

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Could You Plan To Make Yourself More Self-Reliant?

There are simple steps everyone could take to create more food security. Building a larger reserve of food is one. Another is to produce more yourself, and do more home processing. That could mean more storage space and tools for processing. Learning to use more whole grains and similar staple foods might be another useful step. Can you make a list of all the things you could do to increase your personal food independence and form them into a plan of action?

Where Is The U.S. Food System Going?

We are all aware of how farms, food stores, and the type of food available have changed. If that kind of change continues into the future, what kind of food will we have, and what will the system of producing and delivering food be like? Is this the kind of food system we want? Think about those questions in terms of your own desire for food, and your community's situation as well.

Are we as individuals trapped in a system of producing food over which we have no control, or is there still time for us to learn what is happening and exert pressure for change? What options for learning and for influence do we have? Is it possible for us to create a plan that would show how the abundant resources of this country could be managed to produce large amounts of food at reasonable cost and without burning up our soil and fuel resources?

With all our attention on energy problems, we have tended to overlook a very serious situation that is growing worse every year. There is more to food than breakfast, lunch and dinner. We need to start asking questions about our food supply, how secure it is, and what we can do to make it more secure for the future. These questions might be used as a springboard for classroom discussion, and could be the focus of activities that will help students understand the workings of their food system.

Energy and Order -- Mark Terry and Paul Witt

This activity is designed to demonstrate how energy and food are interconnected, in both a technical and an economic sense and to provide some concrete examples of the inefficiency of American agriculture and the scale of the world food situation.

Students are asked, in advance of this class period, to bring in one or two packaged foods from home. Emphasis is on examples of over packaging. An analysis of the foods and their packaging is then conducted. We find it helpful to demonstrate the entire procedure for the whole class using a can of Pringles Potato Chips, our favorite example. (Apparently it is necessary to use paperboard, plastic, and aluminum to raise the price of a pound of potatoes from 10 cents to $1.50.) To avoid wasting any of the food during the activity have various other clean containers handy.

I. Understand What's In The Container
   a. What is the net weight of the food?
   b. How many calories/unit of weight does the food contain?
   c. How many calories are provided by the food in the container, total?

   (Occasionally this information is provided on the package.)

II. Understanding What's In The Container
   a. What is the nature of each kind of packaging making up the container?
   b. What is the weight of each component of the container?
   c. What is the energy used per unit of weight for each component?
   d. What is the total number of calories used in manufacturing the container?

   (Here we rely on figures derived from many sources, especially Energy & Food.)

Conversion Factors for Packaging Materials -- Throwaways

Paper, Cardboard	6,000 calories/kg
Steel, Bi-metal	12,000 calories/kg
Aluminum	64,000 calories/kg
Glass	7,500 calories/kg
Plastic	3,500 calories/kg

III. Understanding the Difference
   a. Calorie Content of Food, total __________
   b. Calorie content of container, total __________
   c. Total calorie content of item __________
   d. Fraction representing Food/Total Calories __________
   e. % of Total Energy in item that is Food Energy __________

IV. Why Recycle What You could Return?
   a. Recycling of most materials represents about a 10% energy savings. If all materials in the container were recycled, what would be the total energy content of the container?
   b. Returnability of glass and some plastics saves as much as 75%. Using the chart below, calculate the total energy of the container if it were made entirely of returnable glass or returnable plastic.

Energy Content of glass returnables --
Glass Throwaways X .20
Paper throwaways X .50
Steel throwaways X .35
Aluminum throwaways X .20
Plastic throwaways X .60
Plastic returnables = Plastic throwaways X .40
(All figures can be converted using these equivalents: 0.45 kg/1 lb; 28g/oz.)

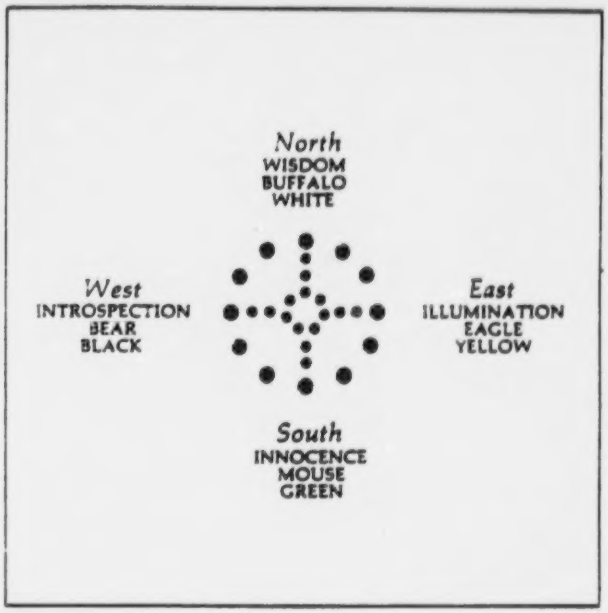
Discussions following this activity inevitably revolve around the nature of waste, the manner in which tastes are shaped by advertising, and the estrangement of most Americans from the sources of food. At this point, try to resurrect the calorie from the ash of the weight watchers fires. There is generally a strong bias against calories, and it is worthwhile to break down this bias and examine its origins. After all, energy in food is essential to life, and calories are nothing more than units that allow us to measure

Native Americans

The oldest Americans in this country, native Americans, are a special breed of people who have much to teach us about our relationship to the land, our place in nature, and the process by which we share this with our children. The American Indians developed through generations a culture based upon the common goal of unifying man and his environment. He believe that harmony and cooperation are the keys to this unity with nature, achieved only by maintaining a delicate balance between the two forceful powers of man and nature. Today environmental education attempts to capture the spirit and vision of this harmony and cooperation and incorporate it into the existing systems of education to create a better quality of learning for our youth.

All education to the American Indian was environmental education, for out of the necessity of survival, the Indian only taught life skills that increased the individual's ability to interact with the environment, and the lessons of this teaching were merely reflections of the lessons nature taught. Many Indian lessons came from listening to nature in a way that many of the great naturalists of our time have kept alive, for the Indian understood the great spirit of nature in all things. The Indian knew the ground speaks, the trees, the land, and the animals speak to us, and that there was wisdom in listening. They attempted to pass this to their children through teaching life skills and through the tradition of oral history. Myths, stories and legends played a central role in teaching about the culture and the world around them. But the major focus for learning in the Indian culture was experience with nature. From each person's vision quest, where a great understanding of their own self was brought to them through a trek in nature, to hunting, gathering, and dealing with the seasons, the experience was the basis for learning.

The Medicine Wheel



– *from the* **Seven Arrows** *by Hyemeyohsts Storm*

Among the People, a child's first Teaching is of the Four Great Powers of the Medicine Wheel.

To the North on the Medicine Wheel is found Wisdom. The Color of the Wisdom of the North is White, and its Medicine Animal is the Buffalo. The South is represented by the Sign of the Mouse, and its Medicine Color is Green. The South is the place of Innocence and Trust, and for perceiving closely our nature of heart. In the West is the Sign of the Bear. The West is the Looks-Within Place, which speaks of the Introspective nature of man. The Color of this Place is Black. The East is marked by the Sign of the Eagle. It is the Place of Illumination, where we can see things clearly far and wide. Its Color is the Gold of the Morning Star.

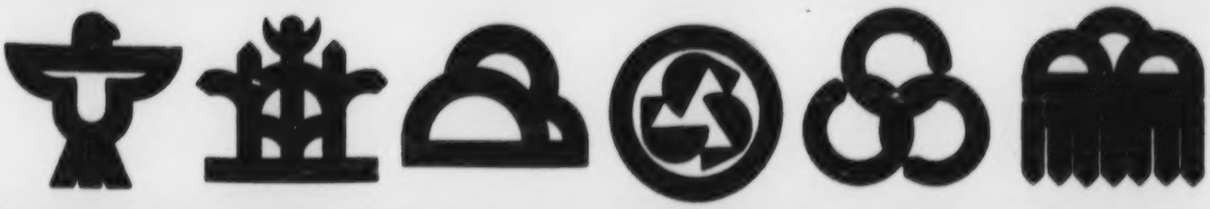
At birth, each of us is given a particular Beginning Place within these Four Great Directions on the Medicine Wheel. This Starting Place gives us our first way of perceiving things, which will then be our easiest and most natural way throughout our lives.

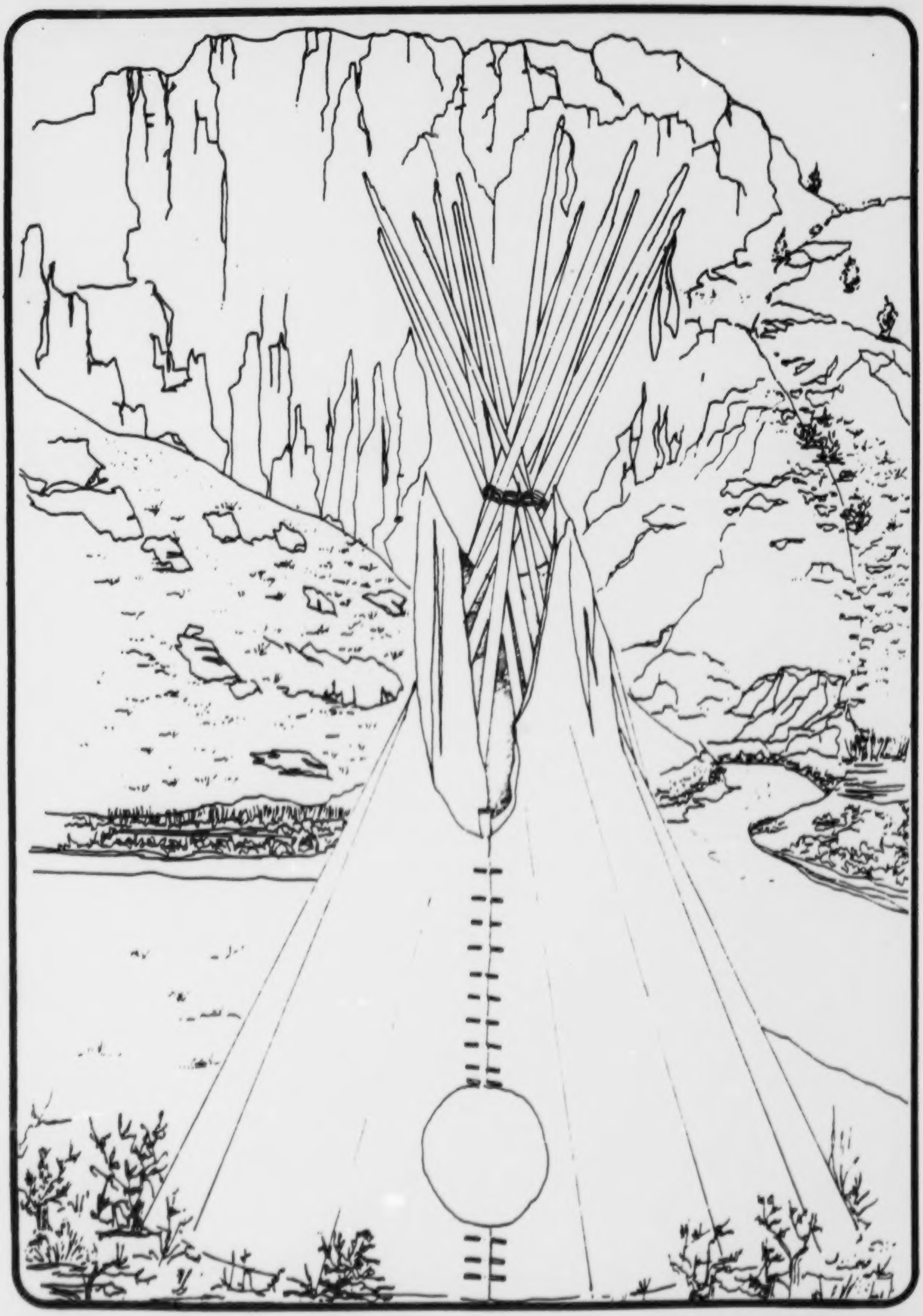
But any person who perceives from only one of these Four Great Directions will remain just a partial man. For example, a man who possesses only the Gift of the North will be wise. But he will be a cold man, a man without feeling. And the man who lives only in the East will have the clear, far sighted vision of the Eagle, but he will never be close to things. This man will feel separated, high above life, and will never understand or believe that he can be touched by anything.

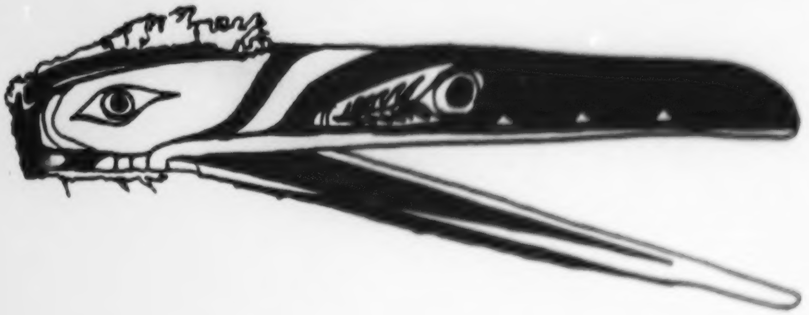
A man or woman who perceives only from the West will go over the same thought again and again in their mind, and will always be undecided. And if a person has only the Gift of the South, he will see everything with the eyes of a Mouse. He will be too close to the ground and too near sighted to see anything except what ever is right in front of him, touching his whiskers.

There are many people who have two or three of these Gifts, but these people still are not Whole. A man might be a Bear person from the East, or an Eagle person of the South. The first of these men would have the Gift of seeing Introspectively within Illumination, but he would lack the Gifts of Touching and Wisdom. The second would be able to see clearly and far, like the Eagle, within Trust and Innocence. But he would still not know of the things of the North, nor of the Looks-Within Place.

In this same way, a person might also be a Golden Bear of the North, or a Black Eagle of the South. But none of these people would yet be Whole. After each of us has learned of our Beginning Gift, our First Place on the Medicine Wheel, we then must Grow by Seeking Understanding in each of the Four Great Ways. Only in this way can we become Full, capable of Balance and Decision in what we do. Seven Arrows speaks of this Growing and Seeking.







A Look at Native American Pastimes

(From the 1979 Sierra Club Calendar
and Almanac for Young People)

Among the Klamath Indians in Oregon, the chief, a speaker or a respected tribe member arose daily and addressed the thirty or forty tribal members:

> My people. We are here together. Let us have peace within ourselves. Let us not quarrel; let us not have hatred within our minds. Let us work for serenity.

Throughout generations this Klamath Indian speech remained the same. To have altered it in any way would have been a violation of its purpose to act as a daily reminder to the tribe the importance of solidarity among the group and their own necessary relatedness.

In the absence of writing, language was developed into a strong tradition of oral literature among the Indian culture. The Klamath convention daily repeating their sort of moral harangue exemplifies the effect of oral literature, whether through tales, songs, poetry or of myth and ritual, to form a common sense of identity within a group. Oral literature represents the art of language in both its creation and its communication. Indians regarded the most powerful Indian chiefs those who were able to command the respect of the tribe by speaking with knowledge and with personality. Similarly, individuals skillful in the telling of myths or riddles, or who could invent word games, were highly respected and often in demand by neighboring tribes.

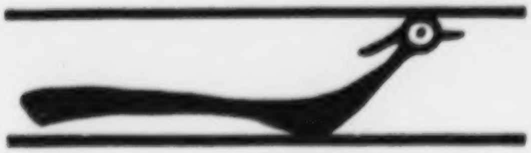
The most beautiful form of oral literature is the myth. Besides combining the forms, styles and features used in other types of oral literature, myths reflect the soul of the Indian culture and thought. They combine the baffling elements of nature, man and his spirit into incredible tales which attempt to offer a sort of cosmic rationality to explain questions which have pondered men since the beginning of time.

Myths of the Pacific Northwest Indians, a few of which are offered on the following pages, offer an astounding number of explanations to account for the wonder of natural phenomena and the universal themes of creation, fire and of certain constellations. The immediate environment provides all the physical and spiritual elements for the myth's construction. Often referred to is a common Northwest bird, the Raven, who was considered by Indians as the "trickster," who, like the coyote for the midwest Indians, was the tricky creator of all living things. Revered animals were given special places in myths, particularly the salmon, which were envisioned mythologically to be the proprietors of great villages and wealth.

Something particularly amazing about Pacific Northwest Indian Coast myths is the valuable record they offer for a study of historic geology. The parallelism between Indian myths and geologists' theory about lakes east of the Cascade Range in what is now the Columbia River Basin has been pointed out in connection with the ancient myth "How Coyote Made the Columbia River." Several details in "The Origin of Crater Lake," a myth related in 1865 by an old Klamath chief, have striking parallels with the story geologists have theorized. Indians called the peak Mount Mazama until the "Curse of Fire" detailed in local Indian mythology collapsed the mighty mountain geologists claim once "rose to a height of 12,000 feet, a mile above its present ruins."

The instructive purpose of myths is clear. When they were told all listeners were quiet and attentive. Primarily, myths were told during winter time or on special occasions. On many Pacific Northwest Indian Reservations, special winter lodges were constructed where hot rocks provided heat while respected tribal members alternately recounted myths from their repertoire.

Much of the role of the Indian myth was to act as a reminder that man's power was empty in the greater forces of nature. Myths often relay the same sort of Christian principle that whatever bad is done by an individual will be returned in kind someday. The difference of this moral code in the Indian world is that man is the destroyer and nature the avenger. In this way, myths also strive to achieve the same message as that of environmental education. The lesson to be learned is that mother earth is a fragile structure with an order of which man is just a part. In order to survive, we must maintain that balance and guard our powers carefully.



Pacific Northwest Indian Myths

THE CHIEF'S FACE ON MOUNT HOOD

Mount Hood (11,253 feet in altitude), the highest peak in Oregon, rises from the Cascade Range southeast of Portland.

Years and years ago, the mountain peak south of Big River was so high that when the sun shone on its south side a shadow stretched north for a day's journey. Inside the mountain, evil spirits had their lodges. Sometimes the evil spirits became so angry that they threw out fire and smoke and streams of hot rocks. Rivers of liquid rock ran toward the sea, killing all growing things and forcing the Indians to move far away.

In those days the Indians also were taller than they are now. They were as tall as the pine and fir trees that cover the hills, and their chief was such a giant that his warriors could walk under his outstretched arms. He was the bravest and the strongest of his tribe.

One night a voice spoke to the chief in a dream. "If you do not conquer the evil spirits that live in the mountain, they will some day throw out a river of fire. The river will flood the land, all the people will be drowned, and your country will be ruined."

The chief knew that he must protect his people. He would fight the demons alone. So he took the long journey to the top of the mountain. There he found a crater, a big hole, which was the home of evil spirits. Scattered around it were some large stones. The chief picked them up and threw them into the crater.

Muttering with anger, the mountain spirits heated the rocks red hot and hurled them back again. The rocks rose toward the sky and then fell a long distance away. The chief hurled more stones into the crater. The demons spewed up hot rocks and smoke and fire.

For many days the battle continued. Then the chief, resting for a moment, looked down upon the land he had left — the land that had once been green and beautiful. The rivers were choked, the forest and the grass had disappeared, the animals and the people had fled.

The heart of the chief broke with sorrow. He had failed to protect his people, and his land was a blackened ruin. He sank upon the ground and was soon buried by the streams of hot rocks.

But some of his people had fled to the tops of the near-by mountains and so were not covered by the rocks. When the earth cooled and the grass grew again, they returned to their country. In time there was plenty of food once more. But the children, starved and weak for so long, never became as tall and strong as their parents and grandparents had been. The people will remain stunted and weak until a great chief comes who can conquer the demons of fire in the mountain. When he comes, the people will be restored to their former size and all the earth will be happy.

Sometimes the old chief's face can be seen on the north side of Mount Hood, about halfway down the mountain. It is a huge shadow, the profile of an Indian head with its scalp lock.

The following legends are excerpted from **Indian Legends of the Pacific Northwest** by Ella E. Clark.

WHY RIVERS FLOW BUT ONE WAY

The animal people helped in the planning and the arranging of the ancient world. The following is a story told by a tribe on the east side of Puget Sound.

Long ago, before the world changed, all the animal people came together for a big meeting. Eagle was the headman of the gathering. He lived up high, in the top of a tall tree. Whenever the people wanted to decide anything important, they called up to him as he sat in the tree, and he gave them his opinion.

Each of the animal people at the meeting had a chance to say what he thought. Even Raven and Mink, who were slaves, told the others what they believed should be done. Raven's opinion was so good that he became known as a wise man.

For a long time the people argued about the direction in which the rivers should flow. Should they flow up or down, or both up and down? All but Raven thought that one side of all rivers should run up the mountains and the other side should run down. All the rivers should go up as far as the falls, they said, and then should turn around and come back.

"What do you think of our plan?" they called up to Eagle.

"I agree with you," answered Eagle. "If the rivers go both ways, the new people who are to come will have an easy time. It will not be hard to go upstream, and it will not be hard to go downstream. What does Raven think?"

"I don't agree with you," replied Raven. "If the rivers turn round at the falls, salmon will have no chance to stop. They will go up as far as the falls, and then they will come right back again. Where will they spawn? And how will the new people catch them? I think that all rivers should flow but one way."

"Raven is right," agreed Mink. "The people will have a very hard time catching salmon if the rivers run both ways."

"I think the rivers should go but one way," repeated Raven. "And I think that at all the bends in the streams there should be little eddies. They will make the salmon go slower. The people can fish there, too."

"Raven's reasons seem very good," said Eagle in the tree.

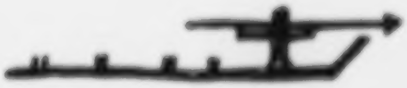
"Raven's reasons seem very good," repeated the people on the ground. So they followed his plan.

That is why all rivers now run but one way. That is why the salmon go all the way up their home river to spawn.

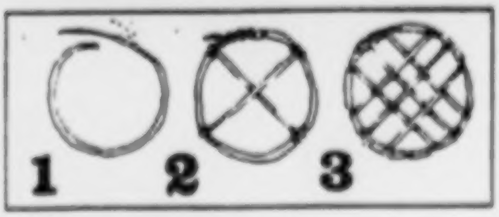
ORIGIN OF THE SWEAT LODGE

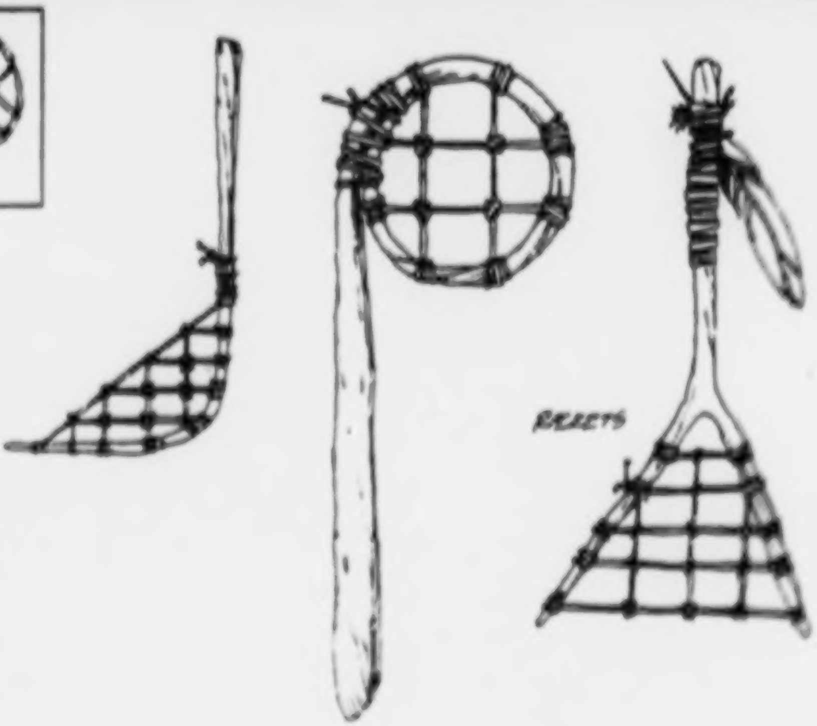
Sweat Lodge was a chief long, long ago; but he wasn't called Sweat Lodge then. He was just called chief. He decided to create all the animals and all the birds. So he created them and named them all. He named each animal and each bird. Then he told each one of them: "In times to come, when people have been created, they will send their children out, during the day or during the night, and you will talk with them and tell them what they will be able to do when they grow up. You will tell the boys that they are to get things easily, are to be good hunters, good fishermen, good gamblers, and so on. You will tell the girls that they will be able to get things easily. At that time I will be Sweat Lodge, myself."

Then he spoke to them again: "I'll have no body, no head, nor will I be able to see. Whoever desires to construct me will have the right to do so. The one that builds me may pray to me for good looks, or whatever he may wish — the one that made me. I'll take pity on him, and I'll give him what he requests — the one that made me. People may approach me thus: If anyone is injured, or if he is sick, or if he is poisoned, he may come to me for help and I'll give it to him. Also, when anyone is dying, he may come to me, and I'll help him then also. I'll help him to see the next world. So in this world I am Sweat Lodge, for the help of human beings."



The Oldest Games





Racket Ball

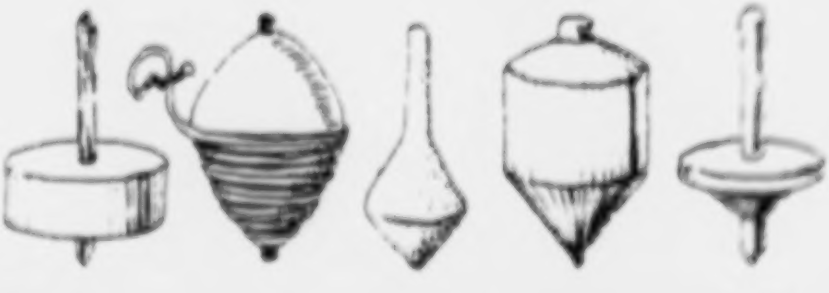
Nearly all Native Americans played ball games called by such names as Wipi-I-Watch, Anetsa, and Baggitiway. Most shared the rule that the ball must be kicked or thrown with a racket or basket, never touched with the hands.

Racket Ball was the earliest form of the game we know as lacrosse. Often whole villages would play against one another. The game was an occasion for a great festival. Players from the two opposing teams scooped a leather ball, filled with hair or straw, from the ground with a wood and leather racket, ran with it, or threw it to teammates. Each team tried to throw the ball through their opponents' goal which could be two poles stuck in the ground or even one sapling bent around to form a wicket.

The ball need not be perfectly round since it is to be thrown rather than rolled or bounced. But it should be soft. The easiest way to make such a ball is to cut a round piece of heavy cloth or leather so that it is about twice as big across as you want you ball to be. Punch holes around the edge and thread cord or leather thong through the holes. Now fill the ball with straw, shredded cloth, dried beans, or sand, pull the cord tight, and tie it. You may have to try several different kinds of filling before you find the one that works best with your racket.

You can make a racket, too, simply by tying a web of string or leather strips in the crotch of a large forked stick. Another method involves trimming the end of a stick until it is thin and pliable. If necessary, soak the stick in water overnight; then curve the stick around until it touches itself and lash the ends securely. Now tie a loose web of string or leather across the hoop. Always be sure that the netted portion of your stick is larger than your ball.

Be careful! Rackets can cause injury to other players.



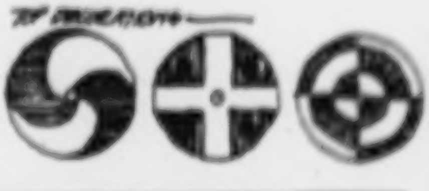
Indian Tops

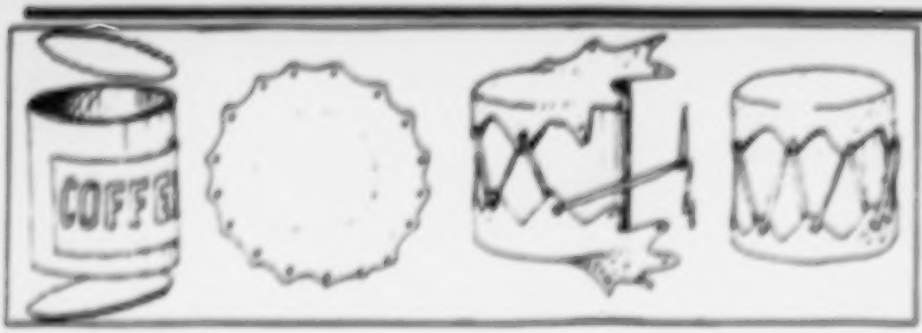
The top originated in ancient times. Made of wood, bone ivory, or clay, carved and painted, it was one of the most widely used Indian toys. In one variation, the whip top, a small whip was used to keep the top spinning.

Tops varied all the way from a carved ivory Eskimo peg top to a simple acorn top with nothing at all added.

The Cheyennes would spin whip tops on the ice in the winter, throwing them into the water when the ice melted in the spring. According to a nursery tale, winter games played in the summer would cause hair to grow all over the body.

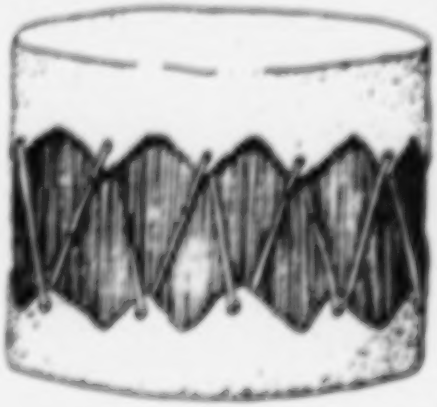
Some tops were made with a handle to prolong the spinning.





The Notched Stick

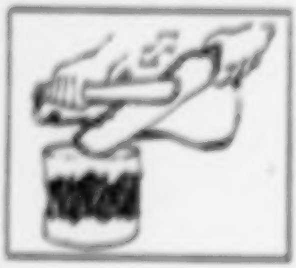
The notched stick produces a rasping sound when rubbed along the notches with a smaller stick. When the end of the notched stick is placed on the top of a drum and then the stick is rubbed, an even richer sound is produced.

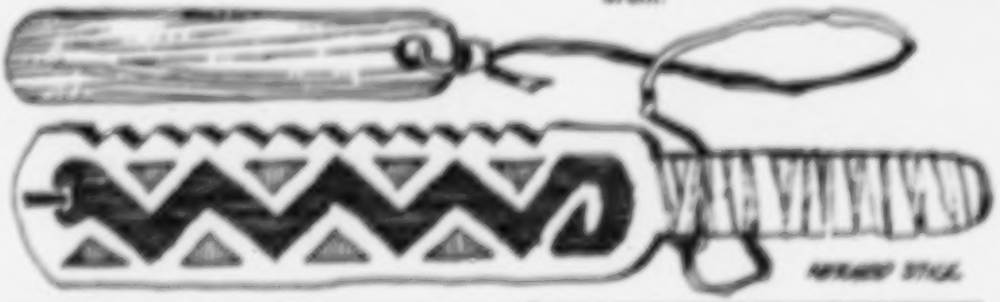


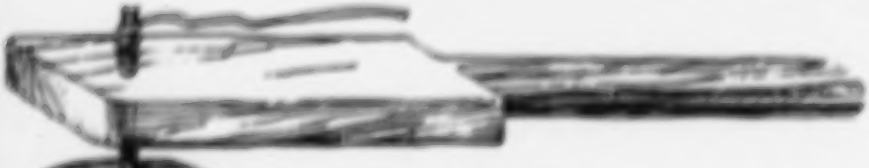
The Drum

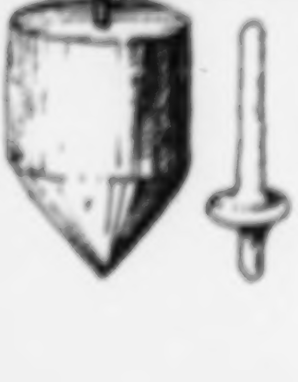
Deep, rich rhythmic sounds come from the drum. It can be played with the hands or with different kinds of drumsticks.

A good drum can be created from an empty coffee can, some leather, and cord. First remove both ends of the coffee can completely. Now cut two pieces of leather about twice as large across as the top of your can. Punch holes all around the edge, and soak both pieces of leather in water overnight. Now lace two pieces of leather onto the can, and tie the cord securely. After the leather dries and shrinks, you will have an excellent drum.



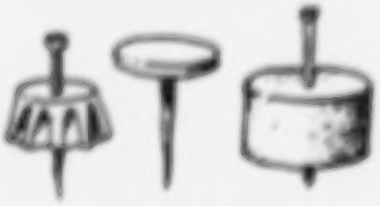


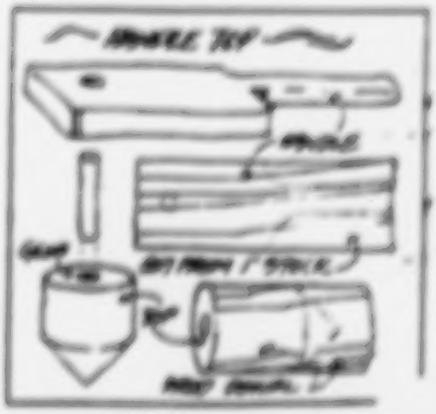




Tiny Tops

Make some small simple tops yourself from bottle caps or corks with nails through them. A thumb tack is a ready-made miniature top.





Indian Basketry

There is no known origin for the craft of basketry, but it is known that Indian tribes ranging from the East coast to the West and from Alaska and Canada to Mexico practiced the craft for both functional and aesthetic purposes. Basketry is one of the earliest art forms, predating even pottery. Baskets were used for carrying water, wood and food, for cooking and held an important place in many ceremonies. Basketry techniques were also used by some tribes, particularly in the Northwest, to make clothing such as ponchos and hats.

The materials used in basketry were indigenous and collected at specific times during the year. For example, the Pomo Indians in the Russian River area of California collected willow branches in spring and fall when they are the longest and most pliable. Collection of materials was only the first step in a continual, year long process. Following gathering, some materials had to be soaked, aged, dried and treated before they were suitable to use. With plants it was necessary to understand the annual growth cycle to insure some plants were left to harvest the following year.

It is possible to make a basket without the collection process. Ideally, naturally fibers should be used and these are easily obtained in craft shops. Suitable materials are jute, wool yarn, cotton cord, string and raffia. The only other item required is a tapestry needle.

Coiled baskets, when finished, look similar to coiled pottery where "ropes" of clay are circled one on top of the other. Basically, the basket is made by wrapping a thinner material around a thick material, coiling the wrapped material and attaching one row to the previous one. Detailed instructions and definitions follow. The method described here is a technique practiced mainly by tribes in the Northwest and Southwest.

Core — The thick material that forms the center of each row or ridge of the basket. It is not visible when the basket is finished.

Thread — A finer material that is wrapped around the core and is the visible part of the finished basket.

Row — One complete circle of wrapped core. The basket is really one long spiral but a row is arbitrarily defined as

continued

beginning at the start of the basket and ending when the covered coil forms a circle and you find yourself at the starting point again.

To begin, cut a piece of core material to about 24 inches in length and cut the thread 24 to 36 inches long. Insert the thread through the tapestry needle and double it. To start the basket:

1. Hold the core in your right hand and place 1½ inches of thread on it. Use the end of the thread opposite the needle.
2. Wrap the thread around both the core and the thread for about one inch. Make a coil of the wrapped section and part of the unwrapped core. Insert the needle through the hole formed by the coil and draw the thread through. Wrap the thread over the core and the first coil and insert needle through the hole again. Repeat this process until the first coil is firmly secured. By this time you should have two to three rows, which constitutes the base. The base will be about one to one and one-half inches in diameter.
3. Once the base is completed, you may wrap the core for three stitches before attaching it to the previous row. Attaching the row is similar to the work just finished. After wrapping the core simply insert the needle through the lower side of the previous row, wrap the thread around the finished coil and the core one time and insert the needle once more through the lower side of the previous row and then wrap the core again for three stitches. Continue this process until the basket has reached the dimensions you wish.

The shape of the basket is determined by the position of the working row. If you want a flat piece you attach the working coil next to the previous coil. However, if you want an upright basket you will lay the working coil on top of the previous coil. Variations between these extremes can be used to create many different shapes and sizes.

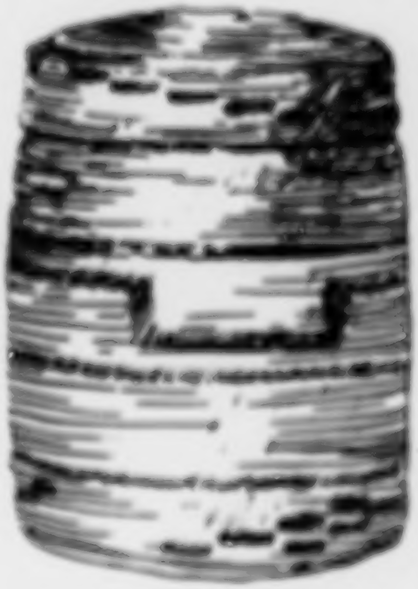
At some point you will need to add thread or core material. Try to anticipate this and leave about two and one-half inches of thread or three and one-half inches of coil. To add new thread, clip the thread you are now using near the needle to release it. Thread the needle with the new piece and lay the open end on the coil. Cover the core and the new thread with old thread for approximately one inch. Go back and pick up the new thread, wind it over the core, old thread and the attached end of new thread and continue.

To add new core material taper the ends of both the new and the old pieces. Place both tapered ends together, wrap and attach tightly.

The objective in adding any new material is to make the addition as smooth and as inconspicuous as possible.

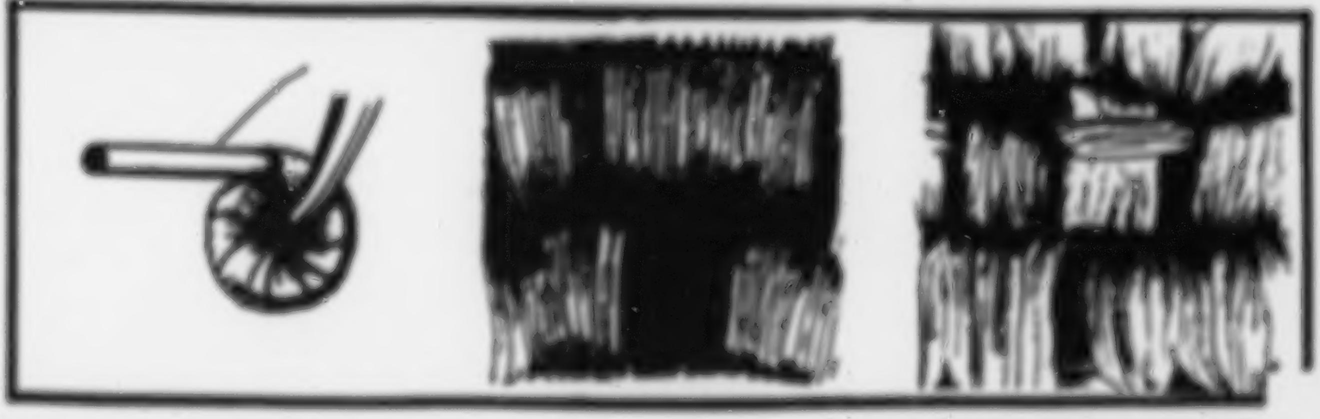
When your work is nearing the size and shape you wish and you want to finish it, you again taper the core. Keep your stitches tight and, at about one and one-half inches from the end, wrap the working row and the previous row with every stitch. When the core is completely covered, take the thread and work it in and out, moving down towards the base for about four rows. Then insert the needle into the covered row and pull the thread through for about two inches. This will secure the finished work and the remaining thread may be cut off.

You now have a finished basket. This is the basic format and there are other



stitches and of course color and design variations. An excellent source book is **Basketry** by F.J. Christopher. It has a chapter on coiled basketry and another chapter covers materials used by the American Indian. Sandra C. Newman has written a book entitled **Indian Basketry Weaving** that covers collection and preparation of materials as well as techniques of the Pomo, Yurok, Pima and Navajo tribes. Her book conveys the spirit of basketmaking as well as the technique.

Basketry is a craft that is easily learned and practiced by all age groups. It provides an understanding of history as well as an understanding of an important form.



Native American Book Reviews

WAR CRY ON PRAYER FEATHER: PROSE AND POETRY OF THE UTE INDIANS
7th - 9th grade
Nancy Wood
Doubleday & Co., Inc.
Garden City, New York, 1979

Indigenous to Colorado, the Ute Indians lived in the mountains of Colorado and New Mexico and were known as great hunters and warriors. In **War Cry on Prayer Feather**, editor Nancy Wood has combined outstanding photographs of the Ute's with their prose and poetry.

The tones of this collection are that of the modern American Indian regaining his native spiritual cultural heritage. Although some of the prose and poetry deal with events of the past, they are in no way merely relics to be collected as artistic pieces. Rather, they are alive and vibrant, as important and inspiring today as they might have been a century ago.

Providing the reader with an insight into native American spirituality, **War Cry on Prayer Feather** also shows the nature of the Great Spirit, not just as a concept but as a presence so beautifully expressed in these Ute poems. We see breaths of life placed in the beings of the earth and sky and how such energies can be channelled introspectively to nurture the soul. Wood impresses the reader with the Ute capacity for life and optimism, a living strength that accompanies these people even in the face of adversity.

Throughout the collection, the concept of the American Indian as protector of our Earth is portrayed. Perhaps it is the concept of the Earth as a living, conscious being that has kept the native American so reverently tied to the land and so aware of its needs.

From reading **War Cry on Prayer Feather** one derives more than a look at someone else's culture. It is an experience for us, a valuable one that can help us better relate to our environment as well.

AN ALBUM OF THE AMERICAN INDIAN
5th - 8th grade

Rosebud Yellow Robe [illegible]
Franklin Watts, Inc.
New York, N.Y. 1969

An extremely informative book, **An Album of the American Indians** presents a thorough investigation of native American life from before the arrival of European settlers to contemporary issues of importance facing American Indians today. Distinguishing **Album** from other books of a similar nature is the manner in which it discusses the psychological implications of the decline of American Indian culture. Written by a native American, the book presents the very real difficulties faced by native Americans living in a primarily white industrial nation.

Beginning with an historical survey of American Indian tribes, ranging from the eastern woodlands to the Pacific Northwest, Rosebud Yellow Robe discusses the lives of these various Indian groups before the coming of the white man. After this introduction to traditional native American life, she proceeds with an historical account of the arrival of European settlers and the consequent decline of Indian culture. Concluding with a discussion of modern Indian life, the author approaches this topic in terms of preserving Indian culture and demanding Indian rights. She also includes a section on native Americans who have triumphed in a white world.

The historical factual information presented by Rosebud Yellow Robe, though extremely thorough, could be found elsewhere. The book's uniqueness arises from the manner in which she intertwines with this information the present day issues and concerns of the native American, thus developing in her readers a consciousness that could easily be overlooked in the education of young, white children.

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ISHI: LAST OF HIS TRIBE

5th grade and up
Theodora Kroeber
Bantam Book
February, 1977

The story of the last survivor of the Yahi Indians, **Ishi** is based on the reports of an anthropologist, Alfred Kroeber, who in the earlier part of this century befriended Ishi and through their communications compiled this account of the last of the Yahi **language** and way of life, together with Ishi's subsequent journey into white, industrial America.

During the later part of the 19th century, the Yahi Indians were violently massacred by white men. The few survivors banded together to form a hidden tribe far from the paths of the white people and lived there as their ancestors had, preserving the traditions of their tribe. Eventually, through sickness, murder etc., all of the Yahis except Ishi died, leaving Ishi as the lone survivor among his tribe. Wandering into a white town in 1911, Ishi first ends up in jail but ultimately finds himself a live-in resident at the natural history museum in the heart of Berkeley where he befriends author Theodora Kroeber's husband.

The outstanding purity of Ishi's being, his clean and loving heart, the ideas of the peaceful tribe create a formidable contrast not only to the violent men who murdered his tribe but also to the general substance of life in the early 20th century. The reader cannot but help to compare the rise and regret that in a great surge for power our nation destroyed so much of its natural strength and valour, a heritage far more native to it than our own European systems of living. Even to the people he meets in the museum, Ishi is always an open and gentle individual. As a man he provides an example for all of us. As a book, **Ishi** takes a concept we've read about abstractly, the destruction of the American Indian culture, and forces us to personally relate to it as a devastating destruction of life and the obliteration of entire belief systems.

CORN IS MAIZE: THE GIFT OF THE INDIANS

1st grade to 3rd grade
Aliki
Thomas Y. Crowell Company
New York, New York 1976

A beautifully illustrated book, **Corn is Maize**, unlike most children's books written about the American Indian, places emphasis on the ecological agricultural aspects of its topic, corn, rather than presenting a purely sociological historical description of the Indian world.

Following an in-depth explanation of the growth and fertilization process of corn, the author Aliki proceeds to discuss the more cultural aspects of maize in native American life. She concludes with a survey of modern products derived from corn and an explanation of how corn is grown today utilizing modern agricultural methods.

Supplying the first to second grader with an impressive amount of information for a book of its size, Corn is Maize should be highly praised for its informative simplicity, its ability to present, through combined text and illustrations, much more than either could convey alone.

WOMAN CHIEF

5-8th grade
Rose Sobol
The Dial Press
New York, New York 1976

Highly unusual in its depiction of American Indian life, **Woman Chief** relates the story of an exceptional woman who refused "...the traditional duties of women and chose instead the hard and lonely path toward glory." **Based** on the historical account of Edwin Thompson Denig, Ruth Sobol's account of the life of Woman Chief tells the remarkable story of how she became a leader of the Crow Nation.

Throughout the novel, Sobol emphasizes that Lonesome Star, the name she goes by before Woman Chief, is in no way representative of the traditional female role in American Indian culture. Other members of Lonesome Star's tribe are often shown criticizing her for her refusal to remain within the bounds of her traditionally designated role and it is only through her skill as a warrior and her determination that she earns the respect that is rightfully hers. Although she always wears female clothing in battle, Woman Chief is never depicted as a woman who is still embracing female virtues, fighting in a man's world. It becomes apparent early in the novel that Lonesome Star's values, those things in which she takes greatest pride and delight, are male. **Becoming** a fine warrior is her ultimate goal and by her early 20's she reaches it by leading her tribe in a battle against the Blackfoot Indians.

Woman Chief depicts a highly violent culture and only treats in depth those cultural practices relevant to Lonesome Star's life. Although this may at first appear to be an unfair description of the Crow Nation, it must be kept in mind that the author is creating an atmosphere which tells the unusual tale of a great female warrior and crow leader.

As Woman Chief ages, the violence of her life begins to soften. Feeling a growing need to spend her life with someone, she again ignores the traditions of her culture by marrying the woman Little Feather. Guiding Woman Chief to an understanding of the need for Indian solidarity in a world that is being quickly transformed by white people, Little Feather encourages her to make peace with the tribes who have been her enemies for so many years. Those tribes however are not willing to forget the violence with which Woman Chief attacked them, and later murder her during an appeal for peace.

As somewhat controversial book, Rose Sobol's WOMAN CHIEF can in no way be considered a representation of conventional 19th century American Indian life. However, the fact that a woman could rise to such power at all and eventually become a respected warrior of her nation makes a statement about the culture in which she was born. Individuals of all ages will feel the impact of **Woman Chief**. Exceptional, yet **Woman Chief** conveys to its readers the spirit of struggle and triumph and it is in this rise and fall of power that we all can share her extraordinary life.

Indian Resources

Touch the Earth
T. C. McLuhan
Touchstone
New York, 1971

A compilation of passages narrated and written by Native Americans, telling of the Indians' relationship with the earth, their kinship with all of nature's creatures and their unity with the elements. Early passages demonstrate the Indians' willingness to share both their ideas and possessions with the white man but later selections reflect their anger with his treachery, their desperation with his broken promises, and their final despair.

Indian Legends of the Pacific Northwest
Ella E. Clark
University of California Press
1953

This is a collection of more than one hundred tribal tales out of the oral tradition of the Indians of Washington and Oregon. They are the Indians' own stories of the mountains, lakes, and rivers and of the creation of the world and the heavens. This book gives insight into the Indians' belief in spirits among all nature, their concepts of creation, and their ideas of right and wrong.

1979 Sierra Club Calendar and Almanac for Young People
Bill Broder
Yolla Bolly Press
1978

This calendar is a celebration of America's first people and especially their children. It is an almanac filled with stories, natural histories, and descriptions of how the Native American people lived before the coming of the "white people." It contains their poetry, their animal tales, their customs and much more. In a special section in the middle of the calendar are ten pages of games and toys that are easy to make, just like those of Native American children long ago.

Seven Arrows
Hyemeyohsts Storm
Ballantine Books
New York, 1972

This book, written by an American Indian, tells the story of the coming of the white man. It is filled with teachings that capture the simplicity and beauty of the Indian way of looking at things. It also presents the deep respect the Indian has for all of Nature's creation.

Book of the Hopi
Frank Waters
Ballantine Books
New York, 1963

This book is an expression by Hopi Indians of the American Southwest about their history, mythology, and rituals. Thirty-Two Hopi elders narrated their legends, the meaning of their religious rituals, and annual ceremonies, and their deeply rooted view of the world.

Black Elk Speaks
John G. Neihardt
Pocket Books
New York, 1972

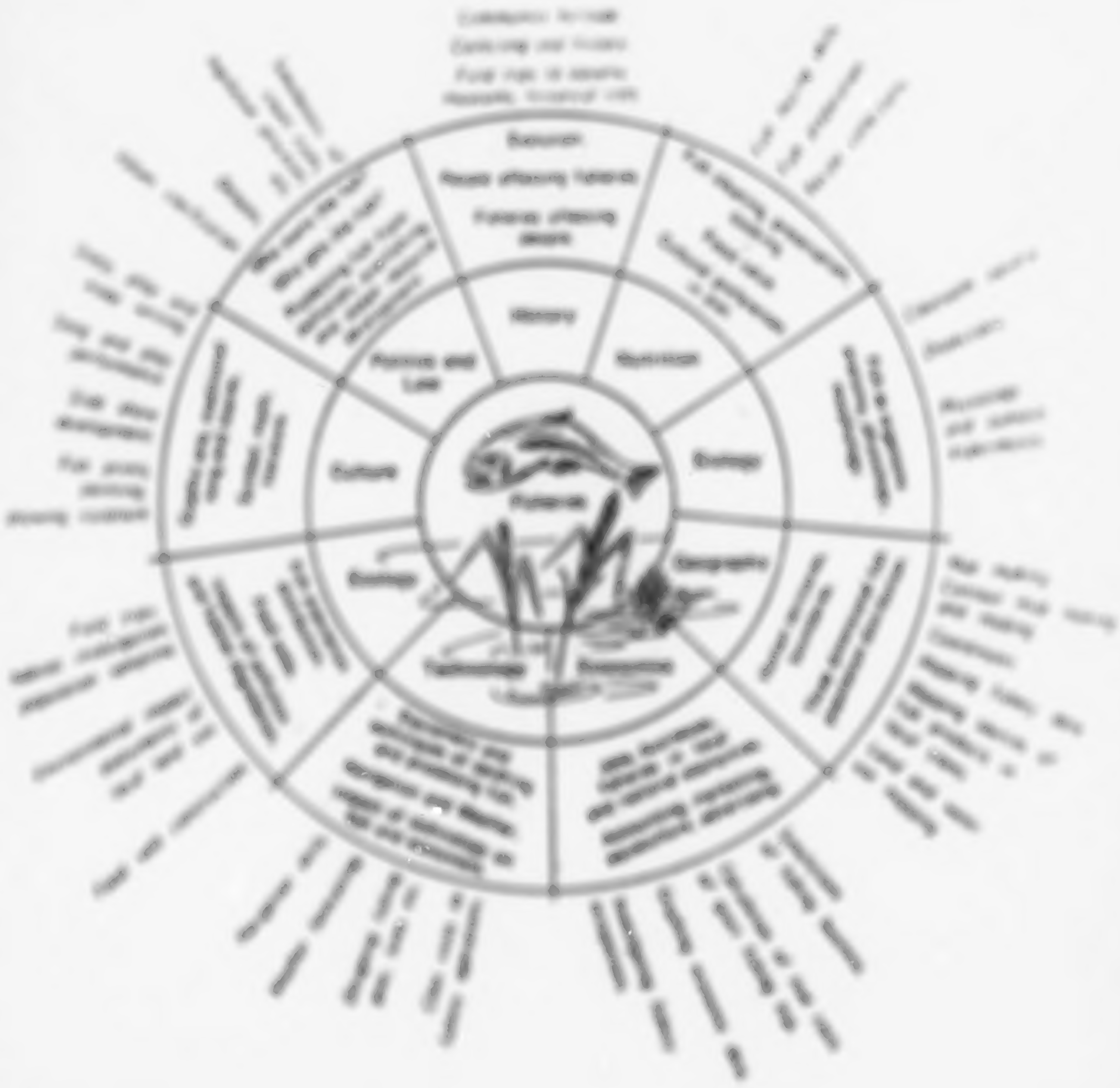
First published in 1932, this book is the personal vision of a man named Black Elk, a warrior and medicine man of the Oglala Sioux. In the book Black Elk, who witnessed the massacre of Indians at Wounded Knee, tells his vision of the meaning of life on this planet as it was for the Indian of the western plains, and as it might be for all men.

Earth Festivals
Dolores LaChapelle and Janet Bourque
Finn Hill Arts
1973

A guide to help you and your children learn from the earth and also benefit physically and emotionally by celebrating earth festivals. In this book you will find ways to celebrate the Autumn Equinox, Winter Solstice, Spring Equinox, and Summer Solstice, as well as weekly celebrations through poetry, art, and ritual for children and adults throughout the four seasons.

Breakers and Cloudbursts

Notes on Marine Education in the Northwest


Research
People affecting fisheries
Fisheries affecting people
History
Nutrition
Politics and Law
Culture
Biology
Fisheries
Geography
Ecology
Technology
Economics

Build A Classroom Aquarium

Bring the World of Water Into the Classroom This Year

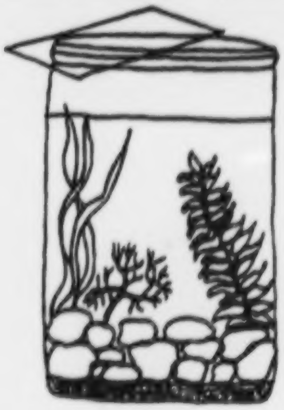
"We sent out and found some pond water close to our school, collected rocks, mud, moss and any insects we had. (You can get jars from most local restaurants for free, the kind of jar they use for pickles, mayo . . . .) When we had filled the jars, we set them in a partially sunny window with a piece of glass covering half the top so that air could get in. Each day we stirred them to break up the film on top. Then we just sat back and watched. After about a week, one of them got all mucky and began to smell. One of them gradually filled up with green algae. And one of them somehow created its own balance. This one is still in our classroom after three years. Last year someone brought in a guppy and we put it in there, too, and it seems to get along just fine. We've had to add more water from time to time because of evaporation, but that's all. It's a pretty simple thing to do, the students learned a lot from it, and now it is a special kind of presence in the classroom — our own small connection with the whole world of water."

Kirk Soule,
Jesuit High School

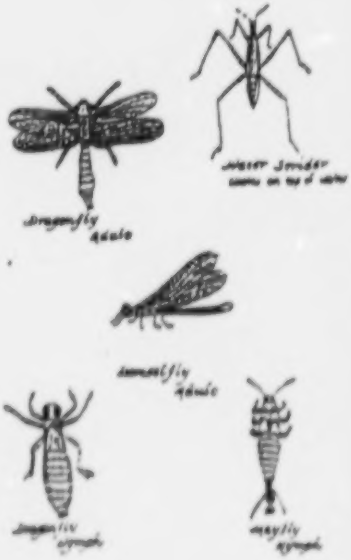
These simple aquariums are really a fun, easy way to get started in marine education. And there are some tips that can help you if you want to do one in your classroom this year.

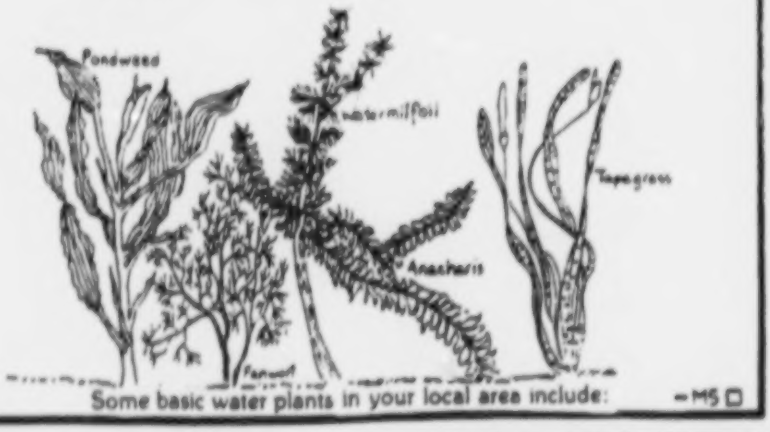
1. **Keep it simple.** You don't need any fancy equipment to start. Just a gallon wide-mouth jar, an old goldfish bowl, or an old aquarium. If you don't have an aquarium, you can usually find one at a neighborhood garage sale for nothing, or ask your students if anyone has an old one they can bring in. Usually four or five students will have them.
2. **The key to an aquarium is keeping it balanced.** This means that the animal life, which gives off CO_2, must balance the plant life, which gives off O_2. Experiment to get a proper balance.
3. **One very useful addition to your aquarium is the common pond snail.** It is a scavenger and goes about eating up all the dead organic matter and helps keep the water clean.
4. **Whenever you add water to the aquarium,** let it stand out overnight so that any residual chlorine is removed, which could upset the balance. A little saliva put into the water helps get rid of the chlorine.
5. **You may need to clean your aquarium out** whenever it begins to get a little mucky with algae. To do this, simply remove the animals, pour out the water, dump out rocks, etc., clean tank and put them all back in. This cleaning will be more needed if you decide to keep fish in the aquarium. Often, an aquarium filter can help keep the system clean for a longer period.
6. **Put one or two students in charge** on a rotating basis, weekly. Taking responsibility for the life there helps them understand the system better.
7. **A basic tool for collecting pond insects** and animals is a dip net, which can be easily made from a coat hanger and old nylon.

Notes from: ***The Amateur Naturalists Handbook*, by Vinson Brown**



Some basic insects in a stream or pond include:





Some basic water plants in your local area include:

—MS ☐

A Day At The Beach

Although scientific study is an exciting and educational way to explore the coast, we and our students can experience the marine environment from many perspectives. Oregonians are fortunate to have lots of parks and public access to our beaches, providing us with a special opportunity and responsibility to nurture positive values and appreciation of the coast in ourselves and our children. The following activities, from Dr. Kermit Horn, Lane County Environmental Education Specialist, are fun, thoughtful, and slightly unconventional ways to enjoy and expand our understanding of the diverse and magic place at the edge of the sea.

Esthetic Coast Experiences

1. Look at a sample of sand under a microscope. Compare dune sand to river sand.

2. Find two beach pebbles exactly the same size.

3. Make a collection of bits and pieces of plastics found in the driftwood. Make an ugly collage or an ugly necklace.

4. Get rope, string, and wire brads. Make a giant driftwood mobile.

5. Place a cupful of dried beans just into the water and watch how wave action moves objects. Come back in 15 minutes and see what's happening.

6. Ever notice how many logs are chainsaw cut on the beach? How did they get there?

7. Bring a large garbage bag and help clean up a beach.

8. Drag a magnet through the sand. You might be surprised.

9. Count 100 waves. Value your meditation.

10. Graph 36 hours of tide using a tide chart.

11. Think about the relationship between wind, waves, and dunes.

12. Make pickles out of "Bull kelp" **Nereocystis luetkeana.** (Write Cape Perpetua Visitor Center, Yahats, OR for information.)

13. Dig clams and chowder, roast in shells, fritter, deep fry, etc.

14. Rent a crab pot and go crabbing.

15. Count the waves per minute crashing against the tide pool animals. How many times do they get slammed by waves a year?

16. Build a sand castle near the uppermost edge the last wave reached. When finished with your sand castle, make a statement about tides.

17. Do some sand casting with plaster of Paris or wax.

18. Find something there is a million of and prove it.

19. Measure the temperature of the dry sand, wet sand, air, water, and you. Write the temperatures in the sand.

20. Investigate holes in the sand. What makes them?

21. Make a sand and driftwood dam across a temporary stream of water on the beach.

22. Look under a few rocks during low tide. Replace them.

23. Listen to the barnacles during low tide.

24. Do all star fish have the same number of legs?

25. Feed a submerged sea anemone some meat, paper, tinfoil, penny. Try your finger.

26. Find an abandoned animal home.

27. Turn a starfish over onto its back. Watch it for 15 minutes. If you get bored, return him home.

28. Obtain a copy of **Oregon's Captive Clams** from Oregon State University Extension Service and learn the names of the six edible clams in Oregon.

29. Compare the typically leathery, hairy, fleshy or waxy leaves of sand dune plants (deserts) to the leaves in a forest.

30. Find a place where sand is being removed (erosion) and another place where sand is being deposited (deposition).

31. Have a contest on who can build the tallest mound of sand inside circles of one foot in diameter.

32. Make an alphabet inventory of a tide pool. C = crab, W = water, R = rock, etc.

33. Listen with your eyes closed and write down all you hear.

34. Have a trust walk through the driftwood. Two seeing leaders on each side of the blindfolded person. Take turns. Go slow. Be careful. TRUST.

35. Have a flat beach rock stacking contest. How high or how many?

36. Make a giant beach mural. Use rocks, sand, driftwood, etc. Make this a group project. Let Mother Nature erase it with the tide.

37. Get an official Oregon state road map and systematically visit every state park.

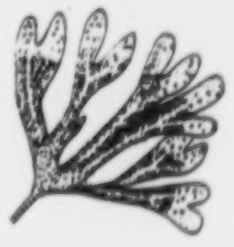
38. Try your hand at sketching a seascape.

39. Find any fibrous material (natural or man-made) and braid it.

40. Boil away a quart of seawater and see the salt.

41. Catch a beach hopper (tiny arthropods) hopping near rotting seaweed. Look at one through a magnifying glass.

42. Write a billboard size poem to the sea gods in the sand, thanking them for the ocean.



Safety at the Beach

Any teacher planning to take a field trip to the beach should be aware of the potential dangers which may be encountered there. Drift logs, steep and crumbly trails, treacherous waves, and incoming tides all must occupy a leader's attention. The following advice comes from the long experience of the staff of the OSU Marine Science Center.

1. Take only a group of manageable size. One adult for every ten students is a good ratio.

2. Be sure the students are dressed properly for the trip. Long pants and tennis shoes (or rubber boots) are a must. Remember: it's almost always chilly at the beach.

3. Be sure a first-aid kit is available to care for the minor cuts and abrasions that are likely to occur.

4. Visit the site of the field trip before the trip date to become familiar with the area the group will visit.

5. Study the tide table; plan to arrive at the beach an hour before low tide. It is safer to be on the beach with an outgoing tide.

6. Check the weather conditions before starting the trip. For the Newport area call 265-5511. For the Coos Bay area call 888-3102.

7. Playing around drift logs is fun, but stay away from those near the water! Logs are easily moved by a small amount of water and a beachcomber can be crushed by a rolling log.

8. Don't let the incoming tide trap any of the group on an outlying rock or ledge. Assign one of the chaperones to a "wave and tide" watch.

9. Protect both your students and rock-nesting birds by discouraging climbing on dangerous rock pinnacles.

10. Write to the OSU Marine Science Center for their materials on planning a field trip to the coast.

In a world older and more complete than ours the whales move finished and complete, gifted with extensions of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings: they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendor and travail of the earth.

— Henry Beston

There are few moments as powerful as seeing the blow of a whale, or its grand shape rising out of the sea to breach, splashing down on its side or back. Even the most distant and faint puff of vapor from a blow invokes a special feeling of the presence of one of nature's most marvelous creatures.

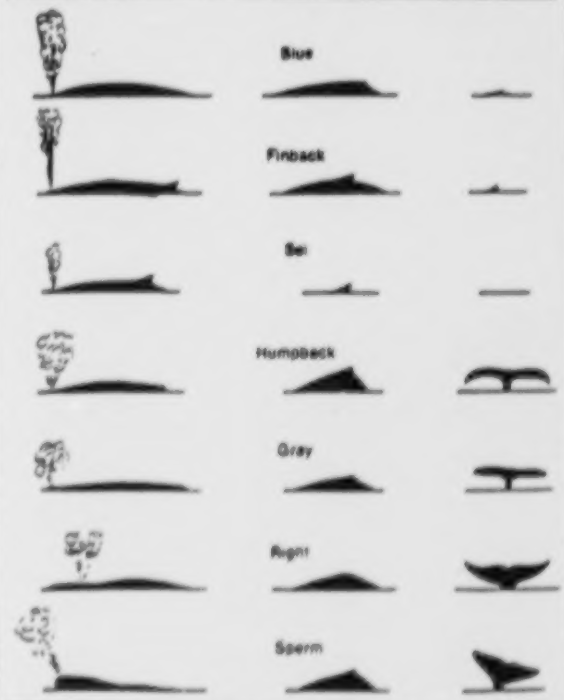
When and Where

1. Observe from coastal headlands that jut out into the ocean — especially those with good elevation.
2. Pick early morning hours. Conditions are usually more favorable before winds cause whitecaps on the water's surface.
3. Choose weather favoring a calm ocean. Don't go during or just after a heavy storm. Overcast days are good for whale watching because there is little glare.

What to look for

1. Scan the horizon and look for the blow — vapor, water, or condensation blown into the air up to 12 feet (3.6 m) when the whale exhales. (Backlighting by the afternoon sun can sometimes be helpful in spotting the blow initially.)
2. Once you locate a blow, stay with it. Where you see one blow, you will see others, either from other whales or a single whale. Getting the range (distance) to whales is a frequent problem, but once established, you can focus your attention on this area.
3. Whales have periodic blow patterns during their migration. Usually an individual will make up a half dozen short, shallow dives before a more prolonged dive of up to 9 to 10 minutes (more generally, 3 to 5 minutes). Frequently the short dives leave turbulent eddies along the surface, so you can track the whale's progress and set up a camera or spotting scope to anticipate the next blow.
4. Usually only a small portion of the whale's head and back show during a blow. Whales can be distinguished from each other by observing the position and/or shape of the dorsal fin, blow, head, back ridges, and tail. If the tail flukes are raised high, the dive will be a deep one (the whale is sounding); in shallow water, the animal may keep the flukes aloft for several minutes while headstanding.
5. Spy hopping is a term applied to a whale with its head partially out of the water in a vertical posture, frequently bringing the eye above the surface. This is thought to be a visual-orientation behavior and may be done near boats to see, "What's that?"

Table 1 — Blowing and diving characteristics of some of the large whales (reproduced by permission from Gordon C. Pike, Guide to the Whales, Porpoises and Dolphins of the North-East Pacific and Arctic Waters of Canada and Alaska)



6. Breaching is a term for the whale's rising vertically out of the water (often 1/2 to 3/4 of its length) and falling to its side or back, making a spectacular splash when it hits the water. The reasons suggested for breaching include knocking off whale lice (an external parasite), communicating, courting, or just having fun. Often where one whale breaches, others will start to breach also. Individuals frequently breach repeatedly, so if you see one breach, get your camera ready — you are in for a real treat!

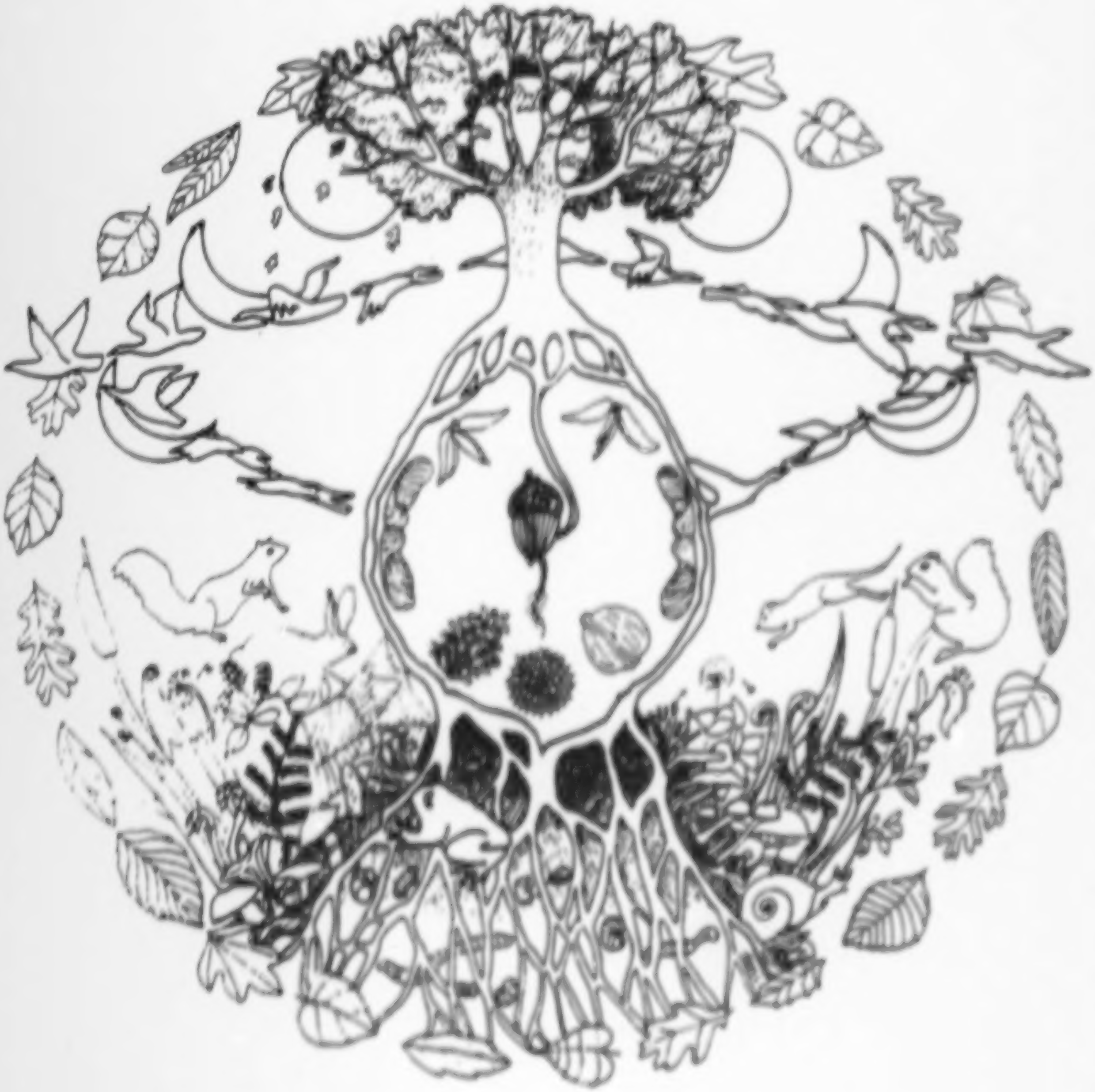
—tips from Bruce Mate
OSU Marine Science Center

The moot point is, whether Leviathan can long endure so wide a chase, and so remorseless a havoc; whether he must not at last be exterminated from the waters, and the last whale, like the last man, smoke his last pipe, and then himself evaporate in the final puff.

— Herman Melville

Autumn

the season for celebration



From issue #16, Fall 1980. Art by Antoinette Blum Caten

Autumn

'Fall is the springtime of the mind'

Summer is abundance. Plenty of food, plenty of sunlight, plenty of free time, plenty of things to do, working in garden, play, traveling.

Autumn is the time when we try to capture the abundance of summer nature for those long bleak winter months. In autumn, plants begin to put their energy into protecting the seeds for spring. In kitchens we are busy putting things by, canning, freezing, drying. Doing what we can to capture the essence of the natural world around us. Insulation, against the months ahead. In our homes, we are busy putting up storm windows, weather stripping, insulating attics, chopping and storing wood. Autumn is the time when we begin to realize that there is finity in the cyclic processes of nature, that abundance is shortlived. A time when we take every moment of Indian summer sunlight to run outside. When we grab what we can to lessen the darkness ahead.

Autumn, like every season, is special in its own way to each of us, whether it be watching seeds fly by, picking mushrooms, watching the moon, or forecasting about the winter using natural signs.

This is a collection of our fall harvest of ideas to share with you ways we explore autumn, some ways to explore autumn within yourselves.

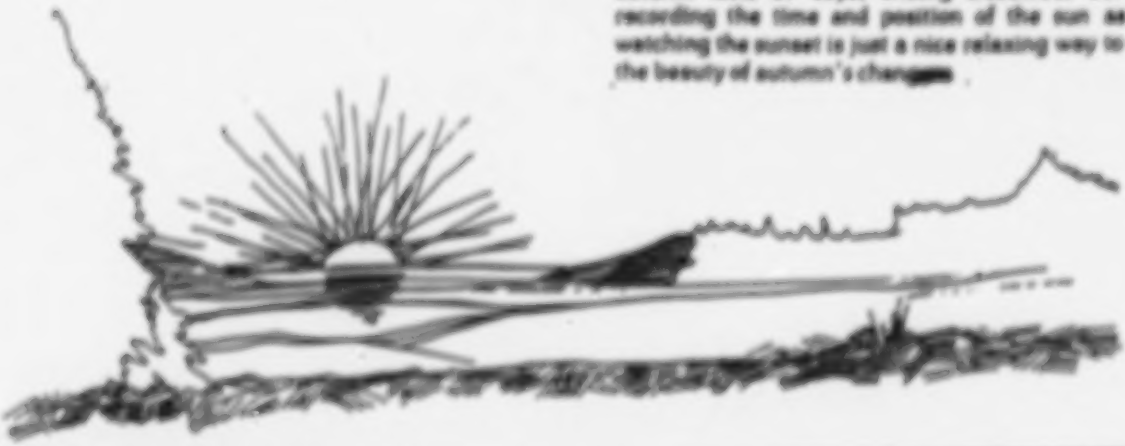
Reading Autumn

Watching the changes of Autumn emerge from summer is a great joy. The crunch of piles of reds, gold, and yellow leaves underfoot. The hollow wind rustling through trees, shaking out a harvest of color. Shelves filling up with jars full of pickles, plums, peaches and pears, all waiting patiently for their turn at the kitchen table. Days growing shorter, clothes turning to wool and down, storm windows and shutters going up, juncos flying down in swarms from the mountains, and mushrooms springing up overnight. Autumn watching is fun because there is always something changing.

> autumn is the time of year when we skip our after school snack to run out and play in the last bit of afternoon sun.

Watching Sunset

You can keep track of the coming of winter by watching the sunset, keeping track of what time the sun goes down each night, or where it finally dips behind the horizon. If you had no calendar you might find this to be an easy way to know what day it is, as the Indians once did. Autumn actually begins on the equinox, when the sun dips below the horizon halfway between its position on the longest and shortest days. The fall equinox is September 23, and autumn lasts 89 days, ending December 21. Besides recording the time and position of the sun as it falls, watching the sunset is just a nice relaxing way to embrace the beauty of autumn's changes.



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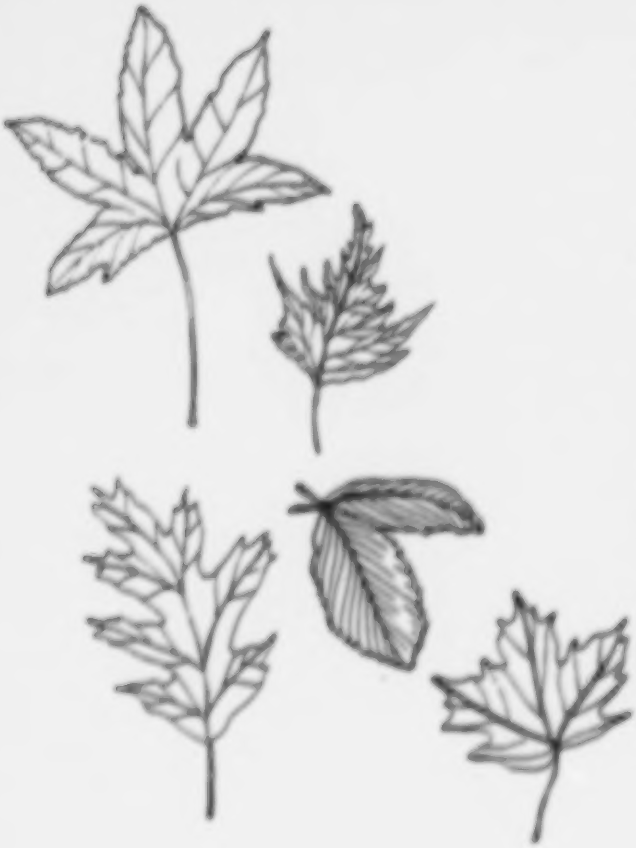
Autumn



autumn is a time when the trees give
back all the colors they took from the
sunlight all summer.

Watching Leaves

First, the sumac and vine maple begin changing color, then the others: the oak, maple, chestnut, beach, and, one by one, leaves begin to fall. Have you ever watched to catch the first leaf fallingoff a tree, counted how many fall each day, or watched the piles getting bigger and bigger each week? Grab a rake, the call goes up. Start raking. Watching the leaves change color and fall to the ground is one way to keep track of the progression of autumn into winter. You can make a display or poster or chart about which trees change color first, which trees have brightest colors, or how many leaves fall one day, week, month. Get your friends together again for a leaf counting party, and end it with a grand leaf crunch.

Watching the Food Mart

Do you ever notice how our markets change with the seasons? Keeping track of what produce is in abundance or how much different fruits and vegetables cost at different times of the year can reveal much about the weather outdoors. You might try to make a display about what foods are in season and how much they cost in and out of season. You can also watch the menu and table for more hot soups, hot cocoa, and other autumn and winter foods. But the best thing about watching the foods in season comes with gathering them and celebrating with an autumn feast.

i know autumn is here when i first hear
myself tell the garden "i am not going
weed you any more."

Autumn

Watching Rain

With autumn in Oregon comes the return of the rainy season. Have you ever tried to count raindrops? If there are too many maybe you'll need to organize your friends into an annual fall raindrop count and work together. Another way to count raindrops is to collect them. A simple rain gauge, made from a bucket, wide mouth jar, or pan with markings on the side is a fun way to find out how much rain has fallen in a day, a week, a month. These rain gauges can also be decorated to celebrate the sky and clouds, the rivers, the lakes, the snow. And while you watch your rain gauge fill up, you can also watch the ground, dry from a long summer, drink up all the rain, you can watch the rivers swell, or just let a few drops bounce on your head.

many trees grow where squirrels forget
the autumn nuts they hid.

just like gold, every ounce of summer is
getting more precious each day
further into fall.

Insulation Watch

One of the signs of the approaching winter in nature is the hustle of animals insulating their homes and their bodies against the cold. In the city you can tell how close we are to winter by counting the houses with storm windows. (count your own first). You might count on your way to and from school or just take a walk around your neighborhood. You could also make a daily count in your classroom of who has put their storm windows up. We think they should be called warm windows, they are more for keeping the warm in than the storm out!

Another sign of change comes in the reading of our electric meters during the fall. Longer and colder nights make our electric bills go way up. If you know how to read you meter, you can check every day or so to see how much effect the change in weather has on your energy use. Making a chart for your classroom is a good way to display the readings from students.

Hats and gloves are a sure sign of autumn. Try counting the ones you see each day or week and reporting to your class. In the north where the days are much colder we used to be able to tell the temperature on any day by just looking out the window and counting hats and gloves.

You can also begin to watch the change in the clothing people are wearing. How many sweaters or heavy jackets do you see each day? can you notice more wool clothing, fewer sandals and shorts? More long sleeves and earmuffs?

So much change is going on in autumn, so much preparation is taking place. In the midst of it all, we can turn our thoughts to below the equator and day dream about the people there who are just taking their storm (warm) windows down, putting on their sandals and shorts and putting away their sweaters, knee warmers and long underwear. Remember, there is always a bit of spring going on somewhere.

Watching the Park, Skies, and Other Places

There are many signs of autumn in the skies, parks, and on the ground. Listen at night to hear the crickets. When do they stop chirping? Did you know you can tell the temperature by their chirps? (Just count the chirps in 14 seconds and add 40 to get the temperature.) Watching the skies can you see the migratory birds heading south? When did the first ones appear? When will the last ones go by? You can record as a class the kind and numbers you see.

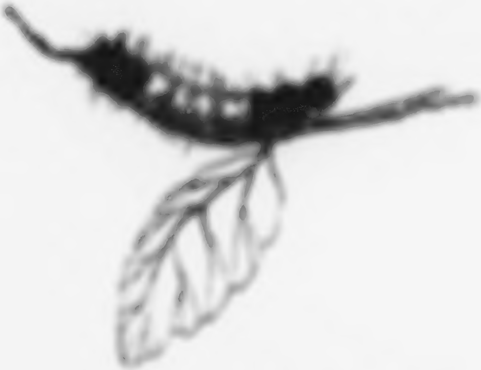
Can you tell when the last dandelion blooms, which is the last rose bud, when the marigolds will begin to fade? If you can notice any of these then you have the makings for your own season lore. Use your observations about nature in autumn to create a little folk wisdom.

when the sumac first turns red,
time to plant the garlic bed.

You might try to collect as many sayings about autumn as you can from parents or books and as a class make an autumn wisdom calendar, wall display or even a small booklet. Have a drawing for each saying and you can make a seasonal coloring book.

Looking to Winter

Animals prepare for the winter by making their coats thicker, slowing down their activity, storing food in their bodies or homes. The wooley bear caterpillar shows us how harsh the winter ahead may be by the width of bands on its body. If the brown outer band is wider than the outside black ones, the winter will be mild....



— when leaves drop early, fall will be short, winter mild
— extremes breed extremes. Hot summer, cold winter
— when moss on north side of tree dries up in fall, look for a mild winter
— rolling thunder in fall, hard winter
— husks of corn and nuts growing thick and tight, look for a hard winter

Capturing the Last of Summer

Catching the changes going on around us in "sayings" is one way of keeping them for the winter. Nature puts all its summer sunshine energy into seeds to last the winters. Many people try to catch summer by canning or freezing fruits and vegetables. There are many other ways to capture summer. Leaf prints, leaf collections, seed collections, summer stories, paintings and drawings or a nature scrapbook, are all simple ways to gather a bit of what is left of summer to make our winter seem a bit shorter. One favorite is to get a small box and fill it with all that we can find that means summer to us. Then put it on a shelf until some cold winter day when you can open it. Just lift the lid, out bursts the sun, blue skys, the shrieks from jumping in the river, the humming of the bees. Try it! A good way to celebrate summer in the midst of winter.

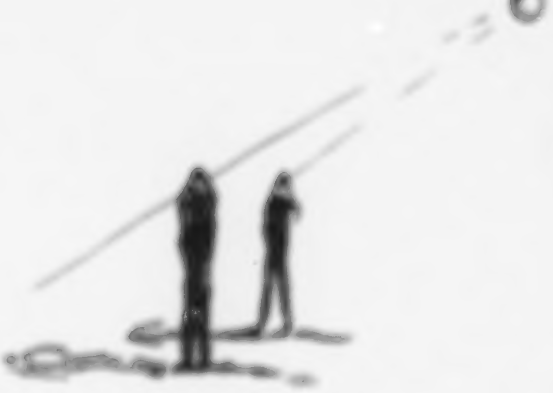
"Rescue the sun," someone cries. "Keep it from going away forever." If we didn't know that the earth and seasons were a great cycle we might get pretty scared thinking the sun was leaving us. What would we do without the sun? Life would be pretty grim, in fact, life wouldn't be. Do you think the trees and plants know the sun will return? Maybe they think that by putting their energy in seeds they can make the sun return. Can you imagine how it feels to be a plant going into autumn, gathering all the sunlight you can in your seeds? Imagine what it feels like to be an animal going into autumn and winter? How would you try to store the sun to last all winter? You might sleep like a bear or cache nuts like a squirrel. Can you think of some other ways you can store sunlight? Have students draw pictures and write stories about ways to capture the sun to last the winter. How about using a ladder, climbing up to the sun, cutting off a piece and putting it in your pocket to keep you warm all winter?

A favorite way to capture summer for us is in a poem, for poems can be carried in your pocket and can make you laugh and feel warm all winter. Haiku, a form of Japanese poetry, has 3 lines, with five syllables in the first and last, and seven in the middle. Haiku comes from the Japanese words, Hai = amusement and Ku = verse. The emphasis for the form is on the rhythm and syllables, not on rhyme.

warm summer sunlight
lying on beach all day long
oops! sunburned again

The Moon

Any body who has worked with city kids in an outdoor environment knows how much fun it can be turning them on to a seemingly different planet than the world they have known. While working in California at an outdoor school of 6th graders from the inner city, our friend Belinda tells us about how, on the weekly night hike walking through the moonlit woods, one member of her group became very excited and scared. Asking what was the matter, she got the response, "Teacher, what is that funny looking streetlight in the sky?"



Special Autumn Moon Events

Harvest Moon. The harvest moon is the first full moon after the autumnal equinox. It rises big and orange along the horizon, moving more horizontally and less vertically than other full moons. Because it rises about the same time as the sun sets, it aids farmers in harvesting their crops by providing extra light.

Hunters Moon. The full moon following the harvest moon is called the hunters moon. It also appears orange and big on the horizon due to the earth's dense atmosphere. It is a little smaller than the harvest moon. Geese can sometimes be seen migrating by the light of this moon.

Moon Eyes

This summer will be remembered because we discovered the eyes of the moon. Here's how to do it. Pick a moonlit night and go out to a field with no other lights. Take a friend along. Standing with your backs to the moon and about three feet apart from each other, put your hands up on top of your head and clasp them. Look down at your shadows and you will see the eyes of the moon. Can you make them blink? look cross eyed? look to the right? look evil? look strange?

the MOON rises as the sun goes down
when it is full.
the MOON rises with the sun
when it is new.
the MOON as she waxes rises later
and later in the day
the MOON as she wanes rises later
and later after sundown.

Moon Lore

The phases of the moon are caused by the varying angle at which its lighted surface is visible from the earth.

There are four moon phases. The new moon and the full moon are the most familiar and easiest to recognize. There are only two moon phases known as "quarters", the "first quarter" and the "third (or last) quarter." They are both actually seen in the sky as half-moons. The profile of each quarter is that of one half of the full moon. The term quarter refers not to the shape of the moon as it appears in the sky but to time elapsed between each twenty-eight day "month."

The new moon is the start of the first half and the full moon is the start of the last half of the lunar month. Each of the four segments or phases has an approximate length of seven days. New moon to new moon is the full cycle of twenty-eight days. Knowing these moon phases is the first step in learning moon lore and working with moon signs.

Moon Rise

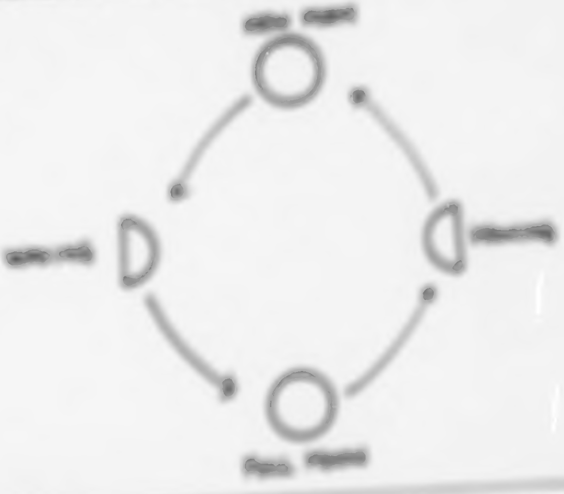
The new moon always rises with the sunrise in the east to start a new lunar month. The sun blots out the visibility of the new moon as it comes up but it can be seen as a thin crescent setting in the west at sunset a day or two after its rise.

The first quarter (waxing) moon always rises about noon in the east seven days after the new moon and appears as a pale half moon.

The full moon always rises in the east at sunset seven days after the first quarter moon and will shed its light through the night.

The third or last quarter (waning) moon always rises about midnight in the eastern sky seven days after the full moon and appears as a half moon.

The waxing or increasing moon is known and easily remembered as the "right-hand moon." The curve of the right-hand index finger and thumb follows the curve of the increasing crescent. The waning or decreasing moon can be remembered as the "left-hand moon."



Weather and Luck

Clear moon, frost soon. The earth cools quickly on clear nights.

To sweep the house in the dark of the moon will rid it of both moths and spiders.

Two full moons in one calendar month brings good luck and is called once in a blue moon.

A wish on a new moon is a wish come true, if you do not tell your wish and if you kiss the person nearest you.

A halo around the moon is a sign of bad weather. This is caused by high cirrus clouds. If there are stars in the halo it will rain as many days as there are stars, or rain will come after that many days. Five stars or more in the ring means cold weather; fewer stars means warm weather.

When the horns or tips of the moon are sharp, watch for high winds.

When the new moon falls on Saturday the following twenty-one days will be wet and windy in nine times out of ten.

If the moon changes on Sunday there will be a flood before the month is over.

When the new moon falls on Monday or "moon-day" it is thought everywhere to be a sign of good luck and good weather.

To point to the new moon brings bad luck.

If Christmas comes during a waxing moon we will have a very good year. The nearer Christmas comes to the new moon the better the next year will be.

If Christmas comes during a waning moon we will have a hard year and the nearer the end of the waning moon the much worse the next year will be.

Moon Months

January	Winter Moon
February	Trapper's Moon
March	Fish Moon or Fisherman's Moon
April	Easter Moon or Planter's Moon
May	Mother's Moon or Spring Moon
June	Stockman's Moon or Mid Year Moon
July	Summer Moon
August	Dog Days' Moon or Woodcutter's Moon
September	Fall Moon
October	Harvest Moon
November	Hunter's Moon
December	Christ's Moon or Christmas Moon

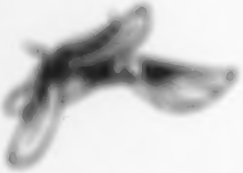
from Country Wisdom
Jerry Mack Johnson
Anchor Press 1974

Collecting Seeds

Autumn is when nature begins putting its energy into seeds to help new life last the winter and be ready for spring. And while the plants and trees are changing color and slowing down, seeds are on the move. Seeds get blown by the wind, hitchhike on pant legs and animal fur, hide in fruits to be eaten and spread in bird's droppings, get shot out of exploding pods, are buried in the ground, and are carried down rivers and streams. Each of these kinds of seed has its own special container, with parachutes, wings, hooks, or covers.

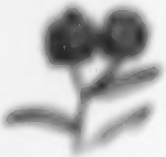
wings

Elms, birches, ashes, and maples all have leafy attachments like wings which help the dispersal of their seeds. Maple seeds, twirl to the ground and may partly bury themselves, giving them a good start in life.



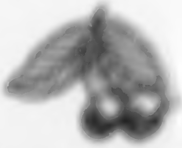
hitchhikers

Burdock, goosegrass, [illegible], agrimony, and foxtail have hooks on their seeds which catch in the coats of passing animals, on pant legs (and in your hair if you happen to be rolling in the grass).



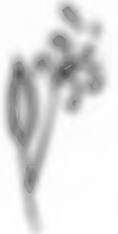
eaten

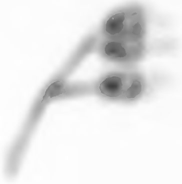
Rosehips, cherry, hickory, hawthorn and apple are some of the seeds dispersed by animals. They are eaten and then passed out in the droppings of birds, squirrels and others.



explosions

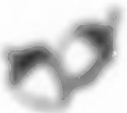
Violets, witchhazel, peas, shepherds purse, and [illegible] all disperse their seeds by some explosive action. As the seed pods ripen, tensions set up in their outer covering which suddenly bursts open shooting the seed away.





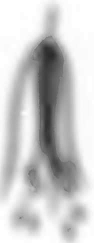
on water

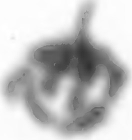
Lotus, [illegible], arum and even coconut have shells which allow them to float on water. Many of these and other seeds are dispersed by the rain, rivers and streams.

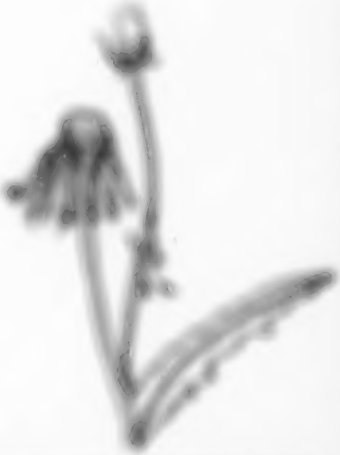


parachutes

Sycamore, goldenrod, dandelion, aster, milkweed, and willow herbs all have light tufts of hairs that allow them to float on the wind. These are good seeds for making wishes by blowing them off on their journey.







Leaf Activities

Maple Leaf Hat

[illegible]

[illegible]

[illegible]

[illegible]

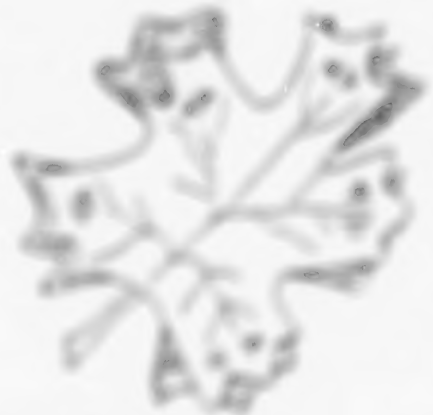
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]



Crayon Pad Prints

[illegible]

Leaf Name Relay

[illegible]

[illegible]

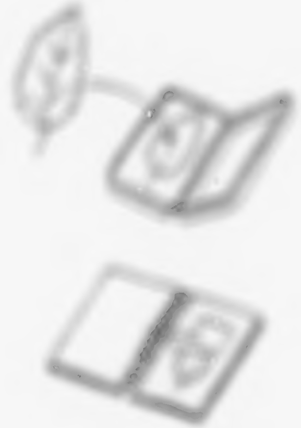
[illegible]

[illegible]

[illegible]

Ink Pad Prints

[illegible]



Leaf Blueprints

[illegible]

Leaf Mat

[illegible]

[illegible]

CAMP CASCADE CAPER

(slides from our fall EEAO conference)

[illegible]

EEAO Goals

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible]

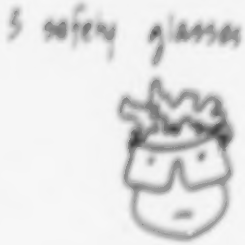
How to Start a Recycling Project

[illegible]

to a successful recycling project should not be underestimated.

5) EQUIPMENT: Whatever type of recycling project you operate, you'll need equipment to handle the materials, and containers in which to store them. Depending on your operation you will need some or all of the following: recycling information handouts, signs, first-aid kit, brooms, dustpan, scoop shovel and trash can for non-recyclables, and gloves.

Other necessary equipment depends on what materials you collect.



1) GLASS - Wooden drum covers with holes to accommodate long-handled sledges for breaking glass, safety glasses, nippers, tool to remove metal rings from bottle necks.

2) CANS - Sledges or a press to crush can, magnet to test metal type (aluminum isn't magnetic).

3) NEWSPAPER - Twine and scissors to tie bundles.

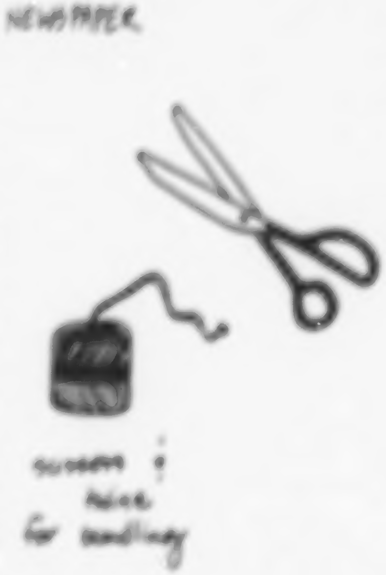
4) CONTAINERS - A wide variety of containers for collection, storage and transport are used, such as metal drums, crates, cardboard boxes, drop boxes, dump trucks and truck trailers.

There are many ways you can collect materials. A **recycling center** usually accepts delivery of a full line of recyclable items, is staffed to assist the community with an emphasis on social service and education, and is usually non-profit. A **recycling depot** is also a drop-off site but is usually unstaffed, may take a full line or only selected items, and may or may not be non-profit. A depot does not require the man-hours or administration of a recycling center, but nor does it provide the opportunity for contact with patrons.

Repeating projects are usually staffed and operated on a regular schedule (e.g. the first Saturday of every month from 10:00-2:00). Often projects like this are run with the help of a large recycling center which can provide transportation and storage of the materials you collect.

A pick-up service can be run in several ways. You can offer "on-call" service, responding to needs as they arise, or you can establish regular residential or commercial routes.

Many schools and businesses organize recycling projects within their buildings. Most are for fine-grade paper, but the possibilities are wide. (One classroom we know uses leftover unopened milk to make pudding after lunch!)

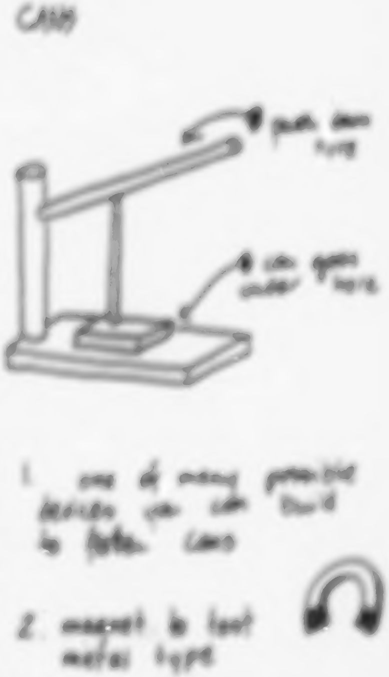


Obviously it is possible to combine approaches to recycling. The important thing is to take on only as much as you are prepared to do well, expanding only as your capacity expands.

Before you begin recycling be sure to find out what legal requirements may apply to your operation. Recyclers have been closed down simply because they did not attempt to comply with local ordinances, so be sure to make a thorough investigation with the proper authorities.

Skilled use of publicity is critical to the success of your project. It can be used to inform the public about the existence and nature of your services, and to keep recycling in the public mind. Consider using the newspaper, radio, television, newsletters of schools, churches, and local clubs, canvassing neighborhoods, signs and posters, and list your selves with DEQ's Recycling Switchboard.

This brief overview is an introduction to starting and maintaining a recycling project. It will be most helpful for the aspiring recycler to visit and talk with veterans. Portland Recycling Team and the Recycling Switchboard are particularly well-informed and eager to lend assistance. The Recycling Switchboard also has three good guides: **A Guide to Running a Recycling Project** (28p., 1977), **The Paper Paper: A Guide to Office Ecology** (36p., 1974, currently being updated), and **A Funding and Information Resource Paper for Recycling Operations** (16P, 1977). All are available from the Recycling Information Office, Department of Environmental Quality, 1234 S.W. Morrison St., OR 97205, (503) 229-5555.


CANS
push down here
can goes under here
1. one of many possible devices you can build to flatten cans
2. magnet to test metal type

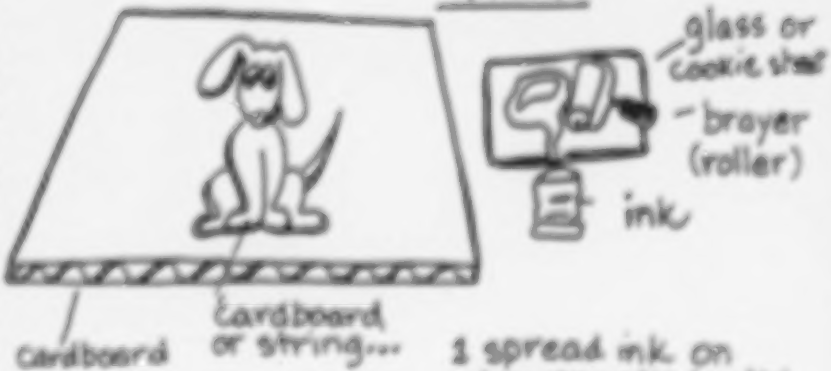
Recycling Curricula and Activities

REDUSE* REUSE* RECYCLE

The curriculum packet, "Reduction, Reuse, Recycling" is now available through the EEAO. The final version is the result of a year and a half's work of recyclers, teachers, members, and students.

Twenty lesson plans are included for grades K-12, in subject areas such as citizenship, math, social studies, science, home economics, art and language arts. The purpose of the curriculum guide is to "provide initial suggestions for infusing the concepts of reduction, reuse, and recycling into everyday living through classroom instruction." A film list, a bibliography, and a glossary of terms complete the 59-page packet. The guide focuses on the concept of individual responsibility for the environment and the activities provide innovative and exciting ways to teach the concept.

Block Prints



1 spread ink on brayer until tacky.

2. Roll ink over block.

3. Press block on paper & rub.

Activity: Recycling and Energy Conservation
Grades 7-12, Math, Science, Social studies

Concept: Recycling reduces energy use, generates income and conserves natural resources.

Process:

1. Have student weigh home garbage each day for a week. Tabulate individual results in chart form.
2. Have student separate home garbage into categories: waste paper, newspaper, glass, metal, plastic and organic matter. Student should weigh each category and record percentage of waste related to food system.
3. Have student pick one category of garbage to research and report to class how much energy it represents in Kwh.
4. Discuss alternatives to generating so much garbage: recycling, reuse of containers, returnable bottle legislation, composting, etc.
5. Visit a nearby recycling center and find out what materials they accept.
6. Set up a recycling center at home to collect these items. Have students weigh remaining garbage for a week and compare results with previous results.
7. Discuss significance of recycling on a worldwide basis. How can recycling help to conserve the world's resources?

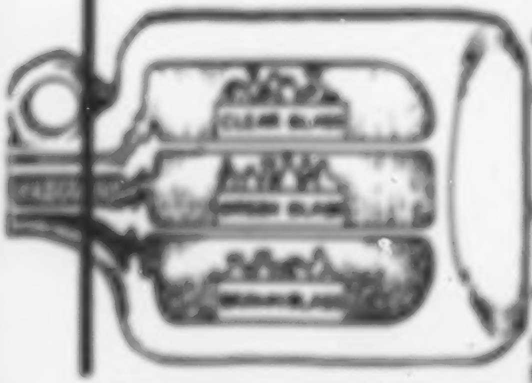
Activity: Solid Waste in the Cafeteria
Grades 10-12, Math and Science

Concept: The volume of waste in school is considerable and the lunchroom is a major contributor.

Process:

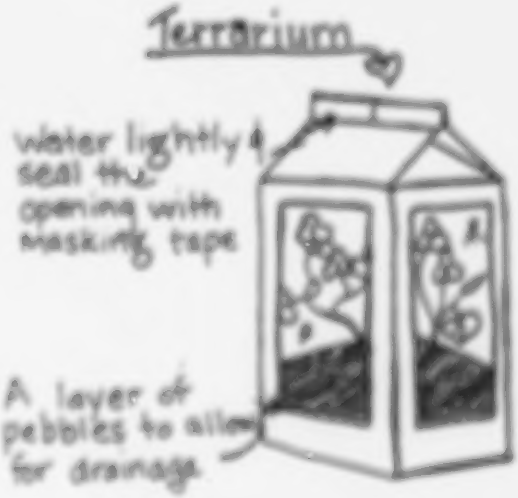
1. Have student save all lunch trash used by each (except food).
2. Weigh waste in class.
3. Have students chart the various items by weight or volume (e.g. paper, plastic, wax cups, bottles).
4. Repeat procedure for several days.
5. Based on classroom amount per person, have students determine how much waste is generated in the school.
6. Invite a representative from the school kitchen to talk to the class about lunch generated waste.

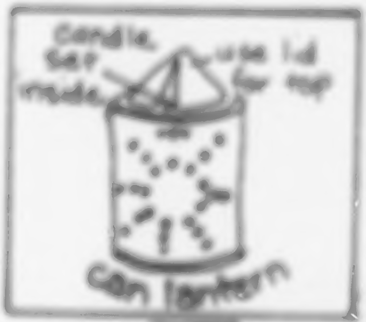
Materials: scale, bags for waste, paper for computing.

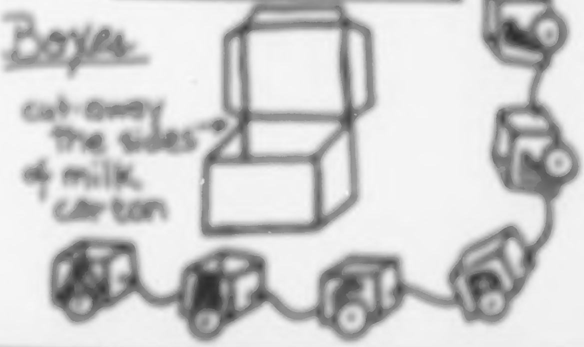


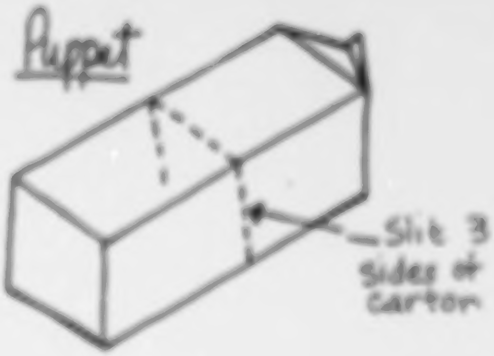
Recyclopedia

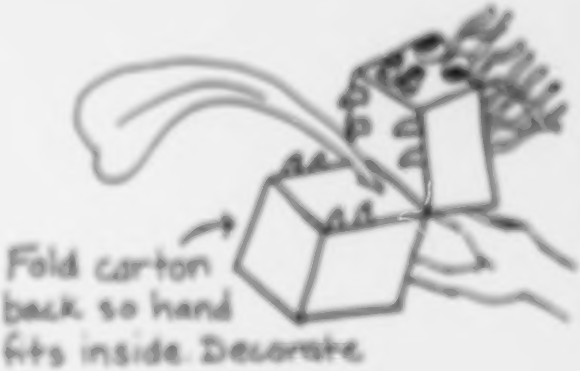
RECYCLOPEDIA, a timely resource book, is packed with ideas on where to find inexpensive, readily available materials and how to use them to create exciting new things. Coming from the Boston Children's Museum, RECYCLOPEDIA is a book thousands of teachers, parents and other adults who work and play with children rely on for low-cost materials and for workshops on making games and equipment for their children's activities.


Terrarium
Water lightly & seal the opening with masking tape
A layer of pebbles to allow for drainage


Candle set inside
use lid for top
Can lantern


Boxes
cut-away the sides of milk carton


Puppet
Slit 3 sides of carton


Fold carton back so hand fits inside. Decorate

Reduce, Reuse, Recycle Resource Guide for 4,5,6 Grades
Yamhill Valley Recyclers, Inc.
1136 Alpine Ave.
McMinnville, OR 97128

Funded by a grant from the American Association of University Women, this guide focuses on eight simple concepts and activities that relate to solid waste problems for grade 4,5, and 6. Produced by the recycling project in McMinnville, the 38 page booklet was supported by the McMinnville School District administrators and teachers. The concepts:

Nature's Cycle
Man's Interruption of the Cycle
Common Resource Use Pattern
Reduction of Waste
Reuse of Waste
Recycling of Wastes
Paper, 3 R's
How to to Recycling

are complemented by a page of statistics, a film list and glossary, and an explanation of how to make paper in the appendix.

The EEPPP Papers:

The Adventures of the EE Project's Poet Philosopher Person,

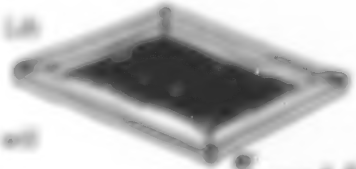
by [illegible]

Hello. I'm back and I had a wonderful summer vacation. I went floating on the river, got carried along some mountain trails, and even took a trip to the city. I haven't got time now to tell you everything I did, but if you want to hear, send me a note and I'll write and tell you much more (I even wrote my first poem). One of the most fun things by far I did though, was to visit PRT and learn how to make paper out of scraps. It was so much fun I thought you'd like to know how too! With help from my new friends at PRT, here's a simple and fun way to make paper.

Ingredients:
scraps of paper
water
small picture frame
piece of screen to fit frame
piece of cloth (ripped up bed sheet) to fit frame
towel
blender
pan, more than 2" deep, and larger than frame
staples or thumbtacks

Method:

1. Staple or tack screen tightly to backside of frame.
2. Fill blender ⅔ full of water.
3. Rip up paper — about 1½ sheets per sheet of recycled paper — and put in blender. You can add brighter pieces for more color, flowers and glitter for texture.
4. Blend until it dissolves into a pulpy mass.
5. Fill pan with water, deep enough to cover frame. Put screen into pan with edges of frame out of water and screen submerged.
6. Pour the paper into the frame, swish it around so it will settle evenly. Lift out of water.
7. Lay the cloth on the wet pulp, on the screen. Blot with towel.
8. Gently peel the wet paper off the screen, onto the cloth.
9. Leave in the sun to dry, or place another cloth on top and iron. (This will make smoother, thinner paper.)
10. When dry, peel away cloth!



wood frame with screen attached

Also:

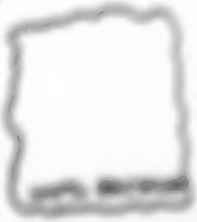
A. You can build a frame out of 1 inch by 2 inch wood.

B. Instead of using the blender, you can cook the torn up paper in a sauce pan, half full of water, over low heat until it dissolves, and then use it the same way.

C. You can make paper of two or more colors by blending different colored paper separately, then pouring them on to one area of the frame at a time, while it is in the pan.

D. You can also add perfume to make scented paper or can try pressing flower petals into the paper when it is still wet.

from PRT



The River Within Us

a multidisciplinary approach to EE

The river is within us. It is a part of everything we do. Yet all see the river differently. To some of us the river means commodities, transportation, industry, power and drinking water. To some of us, the river means fishing, boating, water skiing or canoeing. To some it means history, inspiration or contemplation. It is this diversity which we view our rivers, and the diversity of their roles in our lives, that makes exploration of the river so exciting way to learn about the things around us.

"... So this is a River!"
"The River," corrected the Rat.
"And you really live by the river? What a jolly life!"
"By it and with it and on it and in it," said the Rat. "It's brother and sister to me, and aunts, and company, and food and drink, and (naturally) washing. It's my world and I don't want any other. What it hasn't got is not worth having, and what it doesn't know is not worth knowing. Lord! The times we've had together!"

Mole and Rat, from The Wind in the Willows

One of the basic concepts of environmental education is that everything is connected to everything else. This simple concept allows us to approach any educational experience in an interdisciplinary manner and to relate the experience to a student's existing base of knowledge. During the past few years, this concept has been the underlying theme of the whole energy education field. Studying energy is an exciting experience because one can begin to see how our food, our livelihood, the growth of our communities, are greatly influenced by our use of energy resources. The idea that energy flows through everything embodies this first law of ecology and interconnectedness.

Similarly, using the river as an educational tool, we begin to see how much it can provide us in the classroom. Through the river we can learn about commerce, transportation and industry. Using the river we can learn about our cities and our towns, and the influences upon their growth. Using the river we can learn about the world of agriculture. And many of our present environmental concerns focus on the river.

But the river, aside from being a useful way to study earth sciences, history, culture, community and environmental concerns, provides us with something more. Using the river we can begin to explore the basics of nature, from the concepts of continuity and change, cause and effect, to the idea of cycles.

A quick search in the library will produce many novels and classics written on the river, from Thoreau to Twain, and as many poems, paintings and sketches. From this, it is evident that the river, in its myriad forms, is really within us. That it is a part of everything we do. From history to painting.

By using the river then, we have a thread that ties learning about the various parts of the world around us together. With this thread, we can begin to make education an inter/multi-disciplinary experience. And with the rivers around us, we have the opportunity to involve students in hands on experiences with the scientific, historical, or cultural aspects of the river.

"The face of the water, in time, became a book. There was never so wonderful a book written by man, never one whose interest was so absorbing, so unflagging, so sparklingly renewed with every reperusal."

Life on the Mississippi, Mark Twain

We can swim in it, fish it, drink it or study it. We can talk about it, float it, sing songs about it, or write poems about it. Through all of these, we can begin to understand how the river is a part of us, and how we can use it to learn more about our community, our environment, and ourselves.

New Perspectives on the River

Stand by a river and watch it flow by. If you try to think about all of its aspects, you find that you have a limited view from its banks. But as tributaries join to make larger rivers, people can share their river perspectives to create a larger, more complete picture of the river.

Dr. Joseph Soldati, O.C.E., shares: "Thoreau, in his journals and notebooks, has spoken of the river as an entertainment -- 'a day's rain produces a new landscape' -- and described his sense of pleasure and wonder exploring rivers by boat or on foot. Pleasure and wonder. Perhaps most of all that is what the river gives to us if we are willing to experience it."

By sharing the thoughts of Thoreau and Soldati, our rivers and streams can provide chances to study more than just science, math or water quality. The creative arts, language arts, history, drama and social studies open up a new range of ways to explore the river environment.

Look at the river through the words of poets and writers, from Mark Twain's Tom Sawyer to Oregon poet laureate William Stafford's poetry. Then try to put your river into words.

Discover new river visions in paintings, films, photos and sculptures. Then let yourself loose to create new images of the river.

Watch river performances -- theatre, music, puppets. You find that river issues, legends and history take on new dimensions.

Rivers were essential to the early settlement of the region. Look back through history to understand how our relationship with the river has changed.

Native Americans, the original settlers, had a special relationship with the rivers. Cultural studies expand our perceptions of the river and its role in Native American legends, religion and everyday lives.

Wallace Stegner, on his first experience with the Snake River, in "The Sound of the Mountain Water," wrote: "By such a river it is impossible to believe that one will ever be tired or old. Every sense applauds it. Taste it, feel its chill on the teeth: it is purity absolute. Watch its racing current, its steady renewal of force: it is transient and eternal."

Stand by the river and watch it flow by and know that through the words and visions of all of these perspectives you can begin to understand the depth and character of the stream.

This is a very simple way to measure the amount of rain that falls. [illegible]

Materials

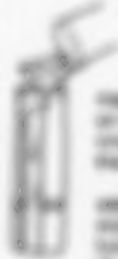
wide mouth jar with straight sides

[illegible]

Directions

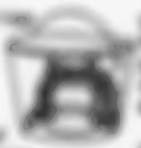
1. Remove the labels [illegible]

2. Fill the wide mouthed jar [illegible]



3. Place a strip of masking tape [illegible]

4. Pour the inch of water from the wide mouthed jar through the funnel into the [illegible]



5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

The River—activities

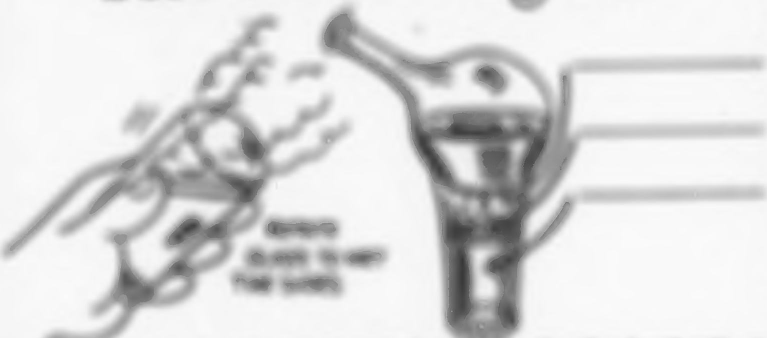
THE AMAZING
CAPTAIN
HYDRO
[illegible]

Follow the adventures of Captain Hydro (also known as [illegible]), the fire hydrant salesman as he battles the water bandit and strives to teach the importance of water conservation.

This fun and creative handbook contains the humorous and water-conscious episodes of Captain Hydro and also includes educational worksheets in water problems, math, climatological data, science, water treatment, stream flow, [illegible], community and home consumption surveys, water crossword puzzles, and art.

To find out how to get copies of Captain Hydro, write East Bay Municipal Utility District, PO Box 24055, Oakland, CA.

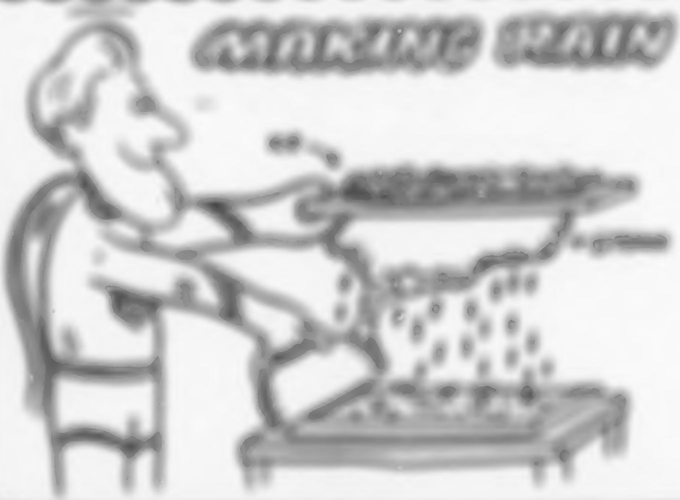
The Water Cycle



Heat some water until it is near the boiling point. Place it in a drinking glass and rotate the glass so as to moisten the glass clear to the top. Place some very cold water in a round flask and set it on the top of the glass as shown.
WHAT HAPPENED?

Place each of the following words in the appropriate space to illustrate water as found in nature: lake, cloud, rain.
Look up the words evaporation, condensation and precipitation, and be able to identify each process in the experiment.

MAKING RAIN



Mount a metal cookie sheet 30-45 cm above a tray of small plants. Arrange cracked ice on it all over the sheet. Place a tea kettle so that the rising steam comes in contact with the under side of the cookie sheet and WATCH IT RAIN. Why doesn't the steam fall on the seedlings rather than rise to the cookie sheet?

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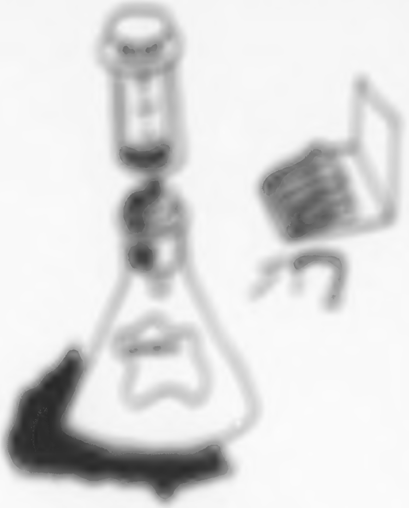
Cloud Making

[illegible]

[illegible]

[illegible]

[illegible]



[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The River—activities

THE HUMANITIES AND THE ARTS

[illegible]

[illegible]

[illegible]

Oregon's Waterways and Rivers

[illegible]

[illegible]

WHERE DOES THE WATER WE USE COME FROM

[illegible]

[illegible]

[illegible]

[illegible]

Winter

a season of [illegible]

Winter

[illegible]

From Soup to Nuts

[illegible]

[illegible]

Tracks and Tracking

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Tracks and Tracking

Who lives in the forest? What creatures inhabit the banks of streams, the shores of lakes, or the sands of the desert? What are the animals that leave footprints in the mud, and trails in the snow? What has gnawed the bark or clipped the twig?

The first snowfall marks the beginning of the real tracking season with most northern tribes, and each fresh snowfall often brings a fresh start. Then the woodsman is given a special power previously only afforded to the animals. He can see the wonders of the trail and learn to follow a track, read accurately the record of the animal's actions, and learn about its very life and feelings.

Tracks are in themselves very much a true language. What is written in foot and paw prints is written in truth; it is ours to interpret it correctly or misread. Wherever the wild animal goes, it leaves behind a record of its visit, its name, the direction from which it came, the thing it did or tried to do and the time and direction of travel. These it puts down in ancient script. Each trail is a wonderful unfinished record of the animal's life. If we could follow it from where it came, it would lead us to that animal's birth place, and where it is going will lead us eventually to the animal.

One of the joys of tracking is that we can observe nature going about its regular routines. Usually, because animals tend to be much more sensitive than us, much more aware of the surrounding, by the time we actually see some animal, it has seen us first, and is more interested in getting away from us than going about its normal daily life. Tracking, then, gives us the opportunity to learn about animals as they live.

SIGNS TO WATCH

Footprints: Best places to look are soft ground, mud and especially after a fresh snow. Often, the second day of a fresh snow is better, for many animals "lay up" for a night after a snow.

Plants that have been chewed: Often you can see chewed leaves, plants, peeled bark, eaten berries, or shredded seed cones of trees.

Trampled plants: Plants can be trampled by animals sleeping or walking. Look for small stems close to the ground.

Pathways: Often you can find evidence of pathways used by animals in an area. Deer trails, moss paths and other places that are regularly used can be found in many areas.

Droppings: Droppings are a good indicator, not only of the kind of animal but of how recent it was nearby. Remember that droppings also vary in animals according to size, age, diet and other conditions.

"In order to have a better understanding of the natural world, we have to learn to see more effectively. We must train ourselves to stop more often and observe our surroundings more carefully."

TRACKING TIPS

What we see in nature is a dynamic system and we must always remember that things will look different to us depending upon the time of year, the age of the area and creatures, and the other qualities of the community we watch. In the same way that an oak tree looks different in each season, so do animals have their own look and actions during different seasons. Each situation we find is uniquely different. Tracks in mud look different from ones in sand which look different than ones in snow.

A little sunlight on snow tracks can melt and enlarge a track considerably. No two animals leave the same trail, which varies due to size, age of animal, sex, and the particular mood or intention of that animal. For that matter, no animal leaves a very consistent trail. Front feet are even generally different from back feet. One last tip is to remember to use your common sense. We need to connect the tracks we see with our other knowledge of the animals in an area.

"Opening eyes to the foot writ of the trail is like giving sight to the blindman, like the rolling away of fogs from a mountain view, and the tracker comes closer [illegible] to the heart of the woods."

RECORDING OUR SIGHTS

There are a few ways to preserve the language we learn in tracking, that we may recognize more easily the characters of this ancient writing. We usually bring with us a field journal and pencil to draw the tracks we see and begin to become familiar with them. Sometimes we bring along a field guide to tracks for our region that can help us identify the tracks. But CAUTION -- the art of tracking lies in studying the track and all the details that go along with it, not in finding the information in a book. The essence of tracking is the information written in nature and we will learn much more if we give our best attention to that. Field guides are fine to check the information we collect on the trail against, but best used around the campfire or back at home.

Another tool we find helpful is a small pocket measure of some kind.

There is a lot of information available about how to make plaster casts and this is a fun way to record tracks. It is also simple to do. Just take some plaster, mix it in a jar with water to a semi-runny condition, make a paper sleeve about 2" high to surround the print and pour in the plaster. The plaster needs to thin enough so that it doesn't run out of the mold or take too long to dry. Experiment to get the best consistency. Once completed, these plaster casts can be painted and become a wonderful kind of crystallization of the tracking experience for us and our children.

"It is essential that we learn to look at nature with wonder and respect. For unless we respect even the tiniest rodent or insect or plant, for what it is, we will never really see it at all, or learn from it the gifts it has for us, the lessons it can teach us about ourselves."

How to Watch Wildlife, by Gordon Burness. 1972, [illegible] pp. from Van Nostrand Reinhold Company, New York, NY.

Some basic hints on watching birds and animals in their natural habitat. Tips on building blinds, taking photographs, and keeping scientific records. Appropriate for younger ages, but practical for everyone interested in tracking.

Ernest Thompson Seton's America, Farida Wiley, Editor. 1962, 413 pp. from The Devin-Adair Company, New York, NY.

A wonderful collection of observations, anecdotes, and stories of the American southwest by one of America's foremost naturalists. Accompanied by the author's sketches, these selections from Seton's work bring alive the humor, joy and love he derived from the natural world.

Tracks and Trailcraft, by Ellsworth Jaeger. 1972 by the Macmillan Company, New York, NY.

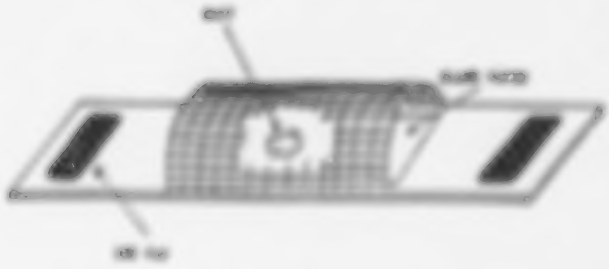
A well illustrated book that explores "nature's finger prints". Individual animal tracks are discussed and illustrated, giving the reader a clear sense of what to expect on the trail in search of tracks.

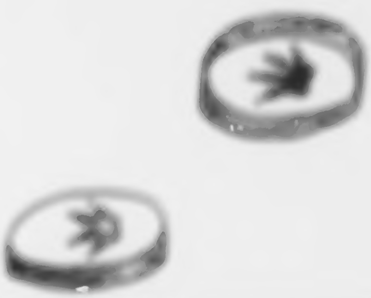
A Field Guide to Animal Tracks, by Olaus J. Murie.

The standard book for tracking enthusiasts. Animal Tracks is part of the Peterson Field Guide Series. Extensive illustrations and information.

Pocket Guide to Animal Tracks, published by Stackpole Company, Harrisburg, PA.

A very simple, well illustrated book giving basic information on the most common animals, including habitat areas. A good book for beginning naturalists, complete with drawings of the animals and their tracks for easy identification.





Here are two versions of a standard activity that students can use to record the tracks of animals in the outdoors. These can be worked into the activities of your outdoor school program, or used throughout the year as a way to "watch" the activities of wildlife in your area.

Tracking

Tracking Station

A tracking station can easily be built in your classroom and set out around your school to attract a variety of animals and their tracks.
You will need:
1 old board approximately 4" x 18" x 1"
1 piece of ½" hardware cloth 12" x 12"
large staples, wire cutters, hammer, blank white paper
thumb tacks
2 ink pads

Cut your hardware cloth 8" wider than the board's width and 6" shorter than the board's length.

Fold over the sharp edges of the hardware cloth so you don't cut yourself.

Center hardware cloth over the board, leaving 3" on each end. Form into an arch, stapling the sides of cloth to the board.

Place white paper inside of arch like a wall to wall carpet. Thumb tack it into place.

Place bait in the center of arch and ink pads on each end of the tunnel. The animal will walk across these pads on his way into the tunnel and leave its foot prints on the paper in the course of getting a [illegible].

Place baited trap overnight in a place where you think animals will be attracted.

Bait: Canned salmon or other meat will be good for carnivores. Carrots, nuts, or apples are good for rabbits and squirrels. Peanut butter is a good all purpose bait.

Plaster Casts

Description: In this activity, students make plaster casts of animal tracks found along the trail, and use them as a means of identifying the animals that live in their area.

Materials:
Plastic baggies — one per child
One cup of plaster of paris in each bag
Strip of cardboard (1" x 12") and a paper clip
Water in a canteen or jug

Procedure:
1. When you find a track on the trail, try to identify the animal. Can you tell what direction the animal was going in? How long it passed through here? Which are its front feet and back feet?
2. Clean the track out very carefully, removing twigs and leaves that might have fallen in it.
3. Encircle the track with a band of cardboard pressed into the soil.
4. Mix plaster with enough water to make it as thick as pancake mix. Squish water and plaster around in your baggie to mix it all well.
5. Pour mixture into ring around track. Let harden about 15 minutes. (It may take longer to harden on a cold day.)
6. Lift out cast from the mud and very carefully clean and transport back to classroom.
7. Back in the classroom, coat your track with vaseline. Surround the cast with a wider strip of cardboard (2" x 18").
8. Pour another batch of plaster into the mold and let harden.
9. Separate the two layers of casts and you can paint the new "indented" track black to make it look authentic.

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THE CHINOOK WIND

The Chinook wind is a warm wind of the Pacific Northwest and of British Columbia. In January or February or March, it may overnight melt the ice-locked streams and strip the lower lands and slopes of their snow. The name was first given to a warm wind which blew from over the Chinook camp to the trading post of the Hudson's Bay Company at Astoria, Oregon.

Long, long ago, the warm west wind was caused by five Chinook brothers. They lived far down the Columbia River, near the Pacific Ocean. The cold east wind was caused by the five Walla Walla brothers. They lived east of the mountains, near the meeting of the waters. The grandparents of the five Chinook brothers and the grandparents of the five Walla Walla brothers lived at Umatilla, the place of the wind-drifted sands.

All these wind brothers blew very hard over the country. Sometimes the warm Chinook wind would dash over the camps, blow down trees, tear up the earth, and fill the air with dust. Then the cold Walla Walla wind would come along and freeze everything with its icy breath. So the people led a miserable life.

One day, the five Walla Walla brothers sent a message to the five Chinook brothers. "We challenge you to a wrestling match," they said.

The Chinook brothers accepted the challenge and came up the river to the place decided upon for the wrestling match. Coyote was chosen as judge. He was to chop off the heads of the losers with his big stone knife.

In secret, Coyote whispered to the grandparents of the Chinook brothers, "If your grandsons are about to be thrown, pour oil on the ground. Then they will not be defeated."

In secret, Coyote whispered to the grandparents of the Walla Walla brothers, "If your grandsons are about to be thrown, scatter ice on the ground. Then they will not be defeated."

So the ground was made smooth, and the match began. First, the oldest Chinook brother wrestled with the oldest Walla Walla brother. When the Chinook brother was about to go down, Coyote called out to the grandfather, "Throw on your oil," and the Chinook grandfather threw his oil on the ground. Then the other grandfather threw ice on top of the oil.

The ground became so slippery that the oldest Chinook brother could not keep his feet. He went sprawling, and Coyote cut off his head with a big stone knife.

Then the second Chinook brother and the second Walla Walla brother wrestled, then the third and the fourth and the fifth. Each time, the Chinook grandfather threw oil on the ground. Each time, the Walla Walla grandfather threw ice on top of the oil. Each time, the Chinook brother went down first, and each time Coyote cut off his head with the big stone knife. So the five Chinook brothers were all killed.

The oldest Chinook brother had a wife and a baby in the Chinook village by the sea. When the child was a tiny boy, his mother said to him, "Your father and your four uncles were killed by the cold Walla Walla brothers. You must make yourself very strong. You must practice wrestling, so that when you are a man you can get even with the Walla Walla brothers for the death of your father."

As the boy grew up, he made himself strong by pulling up trees. He became so strong that he could pull up a large fir tree and throw it away just as if it were a camas bulb. At last he said to his mother, "Now I am strong enough to wrestle with the Walla Walla brothers. Let me go to meet them."

"That is what I have always wanted you to do," answered his mother. So the next night, he started up the Columbia River, tearing up trees as he went. Just before daylight he turned from the big river and went up the Yakima River for a short distance. There he lay down and slept all day. You can still see where he lay, on the south side of a mountain.

In the evening he started out again and went up the great river. Soon he reached the hut of his great-grandparents, at the place of the wind-drifted sands. He found them very miserable, for the Walla Walla brothers had been mean all those years.

Soon Coyote told all the people that there would be another wrestling match. Again he would be the judge, and again he would cut off the heads of the losers. This time he whispered to the Chinook great-grandfather, "Don't throw your oil so soon. Wait until the Walla Walla grandfather throws the ice. Then pour the oil, and your great-grandson will down them all."

The young man wrestled with the oldest Walla Walla brother. "Now throw on your oil," Coyote said to the great-grandfather. But the old man sat still. Soon the cold wind brother was almost down. Then the grandfather threw ice on the wrestling ground. The Chinook grandfather threw on his oil. The oldest Walla Walla brother went sprawling, and Coyote cut off his head with his big stone knife.

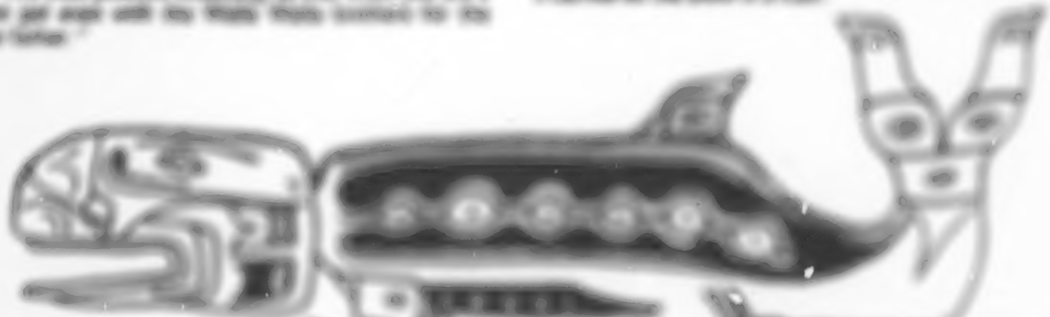
Then the young Chinook giant wrestled with the second Walla Walla brother until he got him down. He wrestled with the third, and he wrestled with the fourth. Coyote chopped off the four heads with his big stone knife.

Only one Walla Walla brother was left, the youngest. He would not wrestle. "One of us must remain alive," he pleaded.

Coyote said, "I will let you live. But I make a law that hereafter you shall blow only lightly. You can never again blow so hard and so cold. No longer will you freeze people to death every time you breathe on them."

Then Coyote turned to the young Chinook. "I make a law that you shall blow hard only at night. You shall blow first on the mountain ridges to warn the people that you are coming. Then you shall come down to the valleys and take off the snow quickly."

And since then, the east wind has blown lightly in the winter, and the warm Chinook wind has blown warm in the spring. Then it carries off the snow in a rush.



Built Environment Education

Exploring the Environment Where We Spend the Most Time

by [illegible]

"**Mankind shapes cities for our needs. Thereafter, cities shape mankind.**"[1]

The environments in which we live have a great influence upon our lives, our actions, our values. Thus, it is essential we have some understanding of the environments, of how they work and what they are made of.

Studying the built environment then, can be very valuable. It is a natural extension of the outdoor school and the outdoor education philosophy. First, by studying the natural environment, we can begin to get a greater sense of our place in and relationship with nature. From this, we can begin to understand natural needs of food for survival and shelter. We can also learn important lessons about the nature of things, about basic concepts of flow, cycles and interaction. Through these lessons, we become more aware of why we have built cities. And this leads us into learning about how cities came about and the idea of design.

"The growing awareness of the impact of the built environment has tremendous relevance for education. We need to teach our children to cope with the complex and rapidly changing world that man has made and to make creative decisions for the future."[2]

Design is the process by which mankind shapes the environment to meet the needs evident at any given time. Throughout history we have designed everything from large scale systems like government and sanitation to small scale systems like chairs and pencils. Obviously, the scale of design is different in each of these cases, yet the underlying concepts of the design greatly affect the outcome.

Designing a pencil might be relatively easy. You could make one, test it out, change it, and continue until you feel what you wanted. When we think about designing the space around us the problems increase. The idea of designing a city is overwhelming. Cities, and the large scale urban systems, have come about as a result of unplanned designs. Very few cities are designed from scratch. The process continuously builds onto the existing structures, or reshapes the old to meet the needs of today. Because cities came about in a very helter skelter fashion, the kinds of designs in a city are many and varied. Studying this diverse environment can yield two things. First, an understanding of the idea of design, the types of design approaches, and ideas about the use of design in problem solving. And second, an understanding of the interaction between man and his environment, either natural or urban, the forces and needs that brought about problems and the solution to those problems.

"Children gain insight into the processes involved in creating and using an environment and an understanding of how it influences them; they learn to examine their own needs and to discover how to set about changing the environment so that it will better satisfy those needs."[3]

As we begin to understand the city and our community through design, we can begin to learn how to use design in solving our future problems. Studying the built environment leads us to a much greater ability to perceive and affect the things around us. We begin to understand not only how to use things but how things work and what they are made of. These both give us a greater sense of our relation to our environment.

The architect is a valuable resource in studying the built environment. For it is an architect's job to understand design, and the effects and processes involved. Teachers and educators deal much more with dynamic interaction than with design. Only recently has the push toward self-derived behavioral objectives come about. Yet in any situation, any teacher could improve their teaching by using design concepts. The beginnings of greater interactions between architects and teachers is healthy in providing teachers a greater perception of the world around them, and a better understanding of the design process.

The article that follows is our attempt to gather together information about existing programs and information on the built environment. Most of the information comes from the Portland area because the greatest amount is happening here. If you know of any other efforts in your area, please let us know so we can share it in other issues.

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Architect-in-Schools Program

The Architect in Schools

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Magic Spots in the Built Environment

Margery Wintermute: Washington County

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Built Environmental Education

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Encounters of an Architectural Kind

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Exploring Your Classroom

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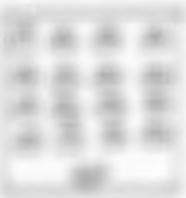

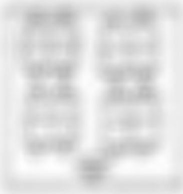

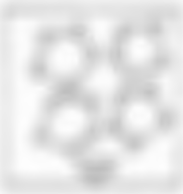

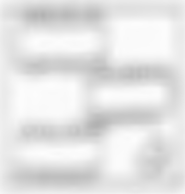

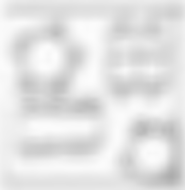

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The story of St. Helens

A Mountain Awakens

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A Great Loneliness of Spirit . . .

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The Food Chain: You Are What You Eat.

By Peter B. Gallagher
St. Petersburg Times Staff Writer

> "This was education. We taught a minicourse in zoology here. We're trying to show people there are a lot of edible foods out there right under our feet. It's all in people's minds. There was probably a lot less cholesterol in what we ate tonight than in what most people eat for dinner."
>
> Dr. Norman Blake, USF

It all began one night at a St. Petersburg tavern where a marine biologist from the Department of Natural Resources (DNR) was arguing with a University of South Florida professor (USF). "I can eat anything you can eat," boasted Danny Roberts of the Bayboro DNR office.

"Oh yeah?" replied Dr. Norman Blake, who teaches marine biology at USF. "Well then chomp into this fella." He produced a live clam from his pocket. Before the astounded gaze of bar patrons, two grown men ate a clam, shell and all. That, however, was not that.

Blake returned to his classroom bragging about past culinary capers, such as drinking milliliters of plankton. Roberts returned to his government lab and said little. Really, what is there to say after eating a clam, shell and all?

Honor, however, had been challenged. There would be no peace among the Bayboro biologists until this matter was resolved. An idea was born: an eating contest. Professor vs. Scientist. First one to get sick loses. The championship of Bayboro. Site: Sunrise Tavern on Third Street S. "We'll eat anything but (bartender) Jack's popcorn," Blake announced to the world.

This was to be no ordinary eating contest. Take the name: First Annual Phylogenetic Eat-Off. After all, these are highly educated, intelligent men. Such scholars must go about eating contests in a sophisticated manner. They must eat according to the phylogenetic food chain.

"Everything must be organic and non-poisonous," said Cary Burns, another DNR scientist. "We wouldn't have them eat black widows. We don't want anyone to die."

Burns and USF student Gary Haywood collected specimens from the different phyla of life and last week trucked it all down to the Sunrise Tavern in ice coolers, buckets, jars and sacks. A crowd of late afternoon imbibers and students gathered at the picnic tables outside.

Blake sat down first. "If it's a tie, the run-off will be a hamburger from USF cafeteria," he announced. The crowd nervously guffawed. A drunk climbed atop a nearby table and held up a fistful of money, offering to take bets against Blake.

Roberts arrived late. "I never had heartburn in my life," he said, "but I got it at 3 p.m. today just thinking about this."

Cans of beer to wash down the ugly tastes of phylogenetic substances, quickly littered the table. The first substance was brought forward.

"Autoclaved mud, where all life stems from," said Haywood, pouring a thick black substance in two cups. "No protein content at all." Applause from the crowd.

Blake looked around in disgust. "What's the big deal? Just mud," he exclaimed, wiping his mouth.

After consuming plankton tea, rotifers and earth worms, Blake screamed, "Bring on the lug worms!" Two wiggling lug worms were brought on.

That finished the annelids. Next the mollusks. The crowd pressed in closer. Two fist-sized squid, with strange eyes, were brought from the cooler and devoured.

Busycon (conch), clams and octopus suffered similar fates. "This is the start of the crustaceans," said Haywood, holding newly hatched artemia. A woman in the crowd whispered to her boyfriend, "This is really educational!"

Blake, sensing the contest had become dull, decided to liven the action by eating a large crawfish.

Someone walked away from the crowd and was sick. Blake and Roberts coyly eyed the situation, chewing on brown seaweed and algae during a beer break — "just for fun."

Action resumed with the roaches. "Tasted like DDT," Roberts grimaced, grabbing for a beer. Spiders presented no problem. Neither did grasshoppers, crickets, silversides, pet-shop meal worms, red snapper or raw chicken liver.

Two raw eggs — whole — and a pair of large Mexican jalapeno peppers ended the competition. Then someone came forward with an ominous looking can. It contained what some say is the worst-smelling, worst-tasting food-stuff in the world. Canned Swedish herring.

A Swedish student explained to the crowd that in his homeland, "you have to sign a clause in your apartment lease that you will never open a can of this stuff in your house."

The smell held up to reputation, the herring had rotted. Blake talked Roberts out of eating it by pointing out the possibilities of botulism. A distraught woman came forward. "Who's gonna pump these men's stomachs out? Let's stop this."

The contest ended in a tie. The professor and scientist toasted each other's success and agreed to form a tag team. Already they have challenged anyone in the world to top their eating feat.

"Yeah. And hey! Where were the reptiles?" said Blake. "We should have had a few snakes."

allies and education

about the environment

By David A. Kennedy
Supervisor,
Science and Environmental Education,
Office of the Superintendent of
Public Instruction
Olympia Washington

The following article is based on David Kennedy's keynote address to the First Annual Arizona Environmental Education Conference, held at Arizona State University in April of 1980. We appreciate the opportunity to share these ideas with readers of Clearing.

Three hundred fifty million dollars. How much is that amount of money? What can it buy? What has that value? Three hundred fifty million dollars was the approximate budget of the city of Phoenix, Arizona during the 1979-80 fiscal year; the cost of the Los Angeles class nuclear submarine in 1977; the value of the corn crop in Kansas in 1977; and the budget for the entire state of Wyoming in 1979-80. Although the examples help to some extent, the amount of money is still a fantasy to me.

The number ought to be significant to those of us interested in environmental education. Three hundred fifty million dollars is an estimate of how much has been spent on environmental education in the United States during the past ten years.

This estimate is based on looking at environmental education from a range of dimensions: the kinds of things that happen in formal school classrooms and outdoor education programs; the kinds of things that resource management agencies do, and foundations, citizen conservation organizations, industries, businesses, and government agencies including the U.S. Office of Education. When you add it all up, since Earth Day 1970, we have spent just about 350 million dollars on environmental education.

I am not going to make a judgment about the impact of those dollars. I would like you to do that. You can see what has happened with that money in your own state.

It may not matter how much has been spent. It does matter that concern about the environment is actually becoming a component of the American way of life represented substantially in our economy.

We should be looking at whether this concern about the environment is actually becoming a component of the American way of education. I am not so certain that it really is.

Most of the three hundred fifty million dollars I mentioned were spent on behalf of public education. I am not sure how much of this money was spent on behalf of children in the kindergarten through high school system. Likely a considerable part of this money was spent ostensibly in their behalf and yet, frankly, I think these young people are neglected. I don't think they are getting their fair share of the results, the receipts, the benefits, and the support. It may be more important to consider this phenomenon from the frame of time and scale. So let's talk about time frames and scale.

It has only been ten years since Earth Day 1970. Ten years is not very long in the time frame of education. Generally, we look at changes in education taking from two to five years minimum. If you are going to change the system that you live in — in this case, the educational system of the United States — you have got a minimum of a two-year impact time. That is not like business and industry where the President of a corporation may say, "I want it," and you know you have got six months to get it done, or you won't be around any longer to try. Education is not like that. Things in education don't change that easily or that quickly. From two to five years is a minimum. Ten years is more realistic, although things are beginning to move more quickly in some areas.

Environmental education as a problem within the larger context of education is complex and gigantic. It is susceptible to management only by sound organization, effective action, and continuing communications. These characteristics apply on any scale you use — whether national, state, or local. It is obvious that those of us who have dedicated a part of our lives to working in the area of environmental education have learned to compete for resources. However, I don't think we have learned to do it well enough. In most cases, we are living frugally on crumbs, leftovers, promises, ambiguity — and an exceptionally strong sense of purpose. We need to fight for resources a little harder — those resources which help us succeed in our efforts to improve the quality of environmental education, and education in general.

Environmental education is maturing. We aren't someone's pets any longer. When we get support, some other program gets less or none at all. To invoke an appropriate metaphor, I wonder if that makes us predators? If it does, I hope that we can be successful predators. As successful predators, we have an obligation to do a better job of organizing, communicating, and of acquiring allies. Perhaps we even need to admit that we are in competition with others for scarce resources.

Recognizing the scarcity of resources, we have an obligation to use any resources in the most effective and efficient ways possible. We certainly have an obligation to let others — who are supportive of our cause — know that we know what we are doing, and that we can do it well. We also ought to make it clear that, in addition to being tough competitors, we can cooperate. It is in cooperation that we get together with allies.

An Eclectic Characterization of Effective Environmental Education

I would like to be more specific about what I mean by environmental education — and what I don't mean. When I talk about environmental education, I am talking about an innovation, as distinct from a change in education. As an innovation, environmental education involves the element of deliberate planning and intention.

Effective environmental education can be characterized as:

holistic: emphasizing relationships and understanding of interrelationships between all things, natural and human;

transdisciplinary, where knowledge of interrelationships between natural and human systems is derived by applying appropriate knowledge from any and all disciplines;

multisensory, emphasizing use of visual, tactile, auditory, olfactory, verbal, emotional, intuitive, imaginative, esthetic, and rational senses;

experimental, based on real-life orientations;

policy-focused, emphasizing solutions to or strategies for resolving issues and problems, local to global in scope;

continuous through time and space, with value placed on historical antecedents, as well as a sense of role and place over time;

ethical, with recognition of contributions of world views to values;

committed to public and private action, based on political realism; and

futures thinking, emphasizing long-term vision with reality-based, utopian overtones.

According to legislation enacting the Environmental Education Act, under the former U.S. Office of Education, environmental education is the "educational process dealing with humanity's relationship with natural and man-made surroundings, and includes the relation of population, pollution, energy, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment." The Environmental Education Act also describes environmental education as "the process that fosters greater understanding of society's environmental problems and also the processes of environmental problem-solving," based on "the development of skills and insights needed to understand the structure, requirements, and impact of interactions within and among various environmental entities, systems, and subsystems."

This definition was the law of the land for 10 years. Unfortunately, the Environmental Education Act has not been funded for program activities in recent years. Perhaps a new Act and a new definition will emerge.

Agne and Nash offer this definition of environmental education:

> **"Environmental education must be a total psychopolitical approach to thinking, valuing and acting which will enable persons to identify the oversimplifications, distortions, contradictions, and oversights in their world views, so that they can understand and resolve the destructive influences these have on psychological, physical, social, and non-human environments."**

Robert E. Roth defines "environmental management of education" as:

> **". . . the process of developing a citizenry that is:**
>
> **"1. Knowledgeable of the interrelated biophysical and sociocultural environments of which man is a part;**
>
> **"2. Aware of the associated environmental problems and management alternatives of use in solving these problems; and**
>
> **"3. Motivated to work toward the maintenance and further development of diverse environments that are optimum for living (modified after Stapp, and others)."**

Perhaps you will come up with your own definition of environmental education, based on your own backgrounds, needs and interests. I hope you do that. The point I want to make in offering you mine and others' definitions is that **environmental education is not just energy education, marine education, population education, conservation education, natural resources education, outdoor education, survival education, or adventure education.** Environmental education includes each of these aspects, and more. It is inclusive, not exclusive. At the same time, environmental education does have limits. It is not everything. However, it is useful to keep the limits fuzzy!

Knowledge and Love in Teaching

Author Annie Dillard says that people are made unique by what they love. Many parents know who their children are by what their children love. To know what kind of educators you are, I need to know what you love. In effect, you are what you love. If you love the desert, then — in a sense — that is who you are. Otherwise, each of us is quite a bit alike. If you love deserts, you are probably going to know, in some sense, quite a bit about deserts. But, if you love nothing much in particular — if you love just what everyone else loves, like nature and music, good wine and good times — then you tend to know nothing much in particular. If you know nothing much in particular, you tend to do nothing much in particular, too.

We have come to realize that teachers who are themselves concerned with their environmental community will tend to develop similar behavior in their students. The student learns and, to an extent, does what the teacher does and knows. The student often does not learn what the teacher is not, doesn't do, and doesn't know.

Where does this line of thinking lead? **I think we need to concentrate our attention and resources on teachers.** The children are the ultimate recipient of our endeavors — but it is the teachers who are going to make it happen. It is the teachers who — by their loving, their knowing, and their doing — are going to increase the probability that learning will occur.

The Nature of Learning That Needs to Occur

Students need to derive from their school program:

1. An accurate and comprehensive grounding in how the environment works. (Cognitive/information)
2. Experience in valuing environmental quality. (Affective/Values)
3. Experience in how personal choices and actions affect environmental quality. (Individual Skills/Individual Action)
4. Experience in methods of enacting environmental responsibility. (Group Skills/Community Action)

Teachers can make this kind of learning take place — if they are encouraged to do so, if they are supported, and if they are allowed to have and to express positive feelings about their environmental community.

Environmental Education — Too Important for Educators Alone

Environmental education is collaborative education. It is a form of education where success is dependent upon many people and circumstances, management and resources, working together. We in education cannot do it alone. Certainly the teacher cannot do it alone. Citizen conservation organizations can't. Industry and business can't. The federal government won't and can't.

I believe that the responsibility belongs to the states. Assistance from the community becomes more essential as the problem reveals itself.

This leads us to the importance of allies. We need allies to fight for resources a little harder. We as allies can come together on the basis of goals we share in common, and common values. We as educators have: a forum, professional educators' perspective, a pipeline to people via students, and knowledge of the system they want to change. They — whoever they may be — have resources, knowledge, personnel, advocacy, and influence. We have to learn to ask for help from potential allies, and to receive help while giving help. It's a trade off. We aren't giving anything away, and neither are they. We're trading things.

In order to change from a temporary system trying to get into the ongoing permanent system of education in this country, we must do those things that will earn us attention and gain us understanding. Otherwise, we will live out our professional lives with the frustration that education has something very valuable to contribute to a gigantic, complex, and continuing problem. And a public — that could thank us for what we are and what we do — will instead continue to ignore us.

We may need to learn to be better predators. We may need to be a little audacious. Let's get on with the job!

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Autumn Moving into Winter

A Season of Treasures

You can measure how tall a tree is by counting the time it takes the highest leaf falling to reach the ground, young Shane told me. I waited for one of the top leaves to cut loose from the huge oak we were close to, and started counting . . . 1 . . . 2 . . . 3 . . . . The wind was strong that morning, and the leaf floated, danced, twirled and whisked on its flight, seemingly not headed for the ground at all, but perfectly happy to be carried on the wind to the end of the earth. I lost sight of the leaf in the distance, still floating and dancing on the wind, still counting . . . 23 . . . 24 . . . 25 . . . quietly to myself. How much taller my friend the oak seems on a windy day.

The time it takes a leaf to reach the ground is a little thing that becomes a treasure of this season. Autumn's greatest treasures are found in these small things, wind shaking tree, leaves falling, sound of dry leaves crunching under foot, rain splashing down, mushrooms springing up.

Spring comes each year with all its excitement and anticipation, autumn moves into winter, bringing quiet treasures, like poetry. Summer's fullness is fading, exposing the season's new growth, another ring, another whorl. Look at nature in autumn, see not only the bounty being offered up, gifts of harvest food and flowers, but see the signs of new growth, new strength in the small things. September and October, end of summer, we spent looking for hidden squash and beans, mushrooms hiding low, looking inside the earth for potatoes, beets and carrots. In November our vision is drawn upwards, honks of geese moving across the sky, blazing reds, yellows of leaves, trees shaking in the wind, leaves cutting loose, floating down, the rain trickling down, first snow on hilltops. Then the moon rises one day in late autumn, so full you think it might burst, not so much to say 'look at me' as to say 'look up.' And when we finally look up, what we see is the whole sky moving and changing.

The clouds and grey sky are being born again. What during summer were only visitors, are now come to stay. It is as autumn moves into winter that the sky comes most alive, clouds passing, moving, hanging, shaping and reshaping, speaking to us of the old season passed and the new coming. Speaking to us of the nature of this time of year. The Indian sign for cloud is close to that for roof or house. When clouds come to stay then, it is the time of the earth house getting its roof. Not only do we spend more time inside during the wintry season, but nature goes inside itself. The clouds coming, along with the colder, shorter days, remind animals to prepare their houses for the winter, to find a new burrow, a new place to hibernate, to move down the mountain, or head south. Autumn moving into winter becomes the time of home preparation, of building new walls and limits which can keep us warm during the winter, a time of pulling back, moving inside ourselves, letting new winds blow the summer fullness away. All while the sky is moving and changing.

For ages we've watched clouds and tried to learn their secrets. What do their shapes speak of, what news do they bring as they move across the sky? And if we can learn to read them or hear them, can we also learn to speak with them? Can we learn an appropriate modern day rain dance or sundance?

There is no doubt that this sky movement, the song of the clouds, affects us in many ways, from changing the kind and amounts of things we do outside, to causing us to feel certain ways. To be more in touch with the clouds and weather, or to be able to read a cloud and foretell the coming rain or snow, is to be more aware in the world. Autumn moving into Winter, when sky and clouds come to stay, is the best time for watching the skies, and learning about the weather. And as in all nature, the lessons come not so much from a book as from watching the clouds themselves. And in watching and foretelling the coming weather, we can prepare to accept the sky's gifts; rain or snow or clear blue sun. And in preparing, we can open ourselves again to the joys of the little things, gifts of the season.

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From our Hearts With our Hands For the Earth

Helping Students Plant Trees

by Michael Soule

This article is mostly about planting trees with children at school. But also it is about creating experiences that build strong, long term connections between children and the earth. It is about building new understandings through working with trees and nature. It is about celebrating the earth in the places we live. It is about working with our children in new ways to create a beautiful green earth.

And every seed I sow,
Will grow into a tree,
And someday there'll be apples
there
For everyone in the world to
share.
Johnny Appleseed

We have worked with children of all ages to help them touch and understand nature, to help them learn about their relationship in the natural world. In all our workings, I have found no experience more powerful and creative for children than planting a tree. It is at once, work and celebration, caring and sharing. It is a simple basic experience that is real and meaningful, active and fun.

Planting a tree is more than just digging a hole, putting a tree in and refilling the hole. It can be exploration into the specific needs of a tree for growth. It can be learning how to use a shovel, or hoedad. It can be an exploration of the qualities of the places we intend to plant, the crumble of earth, the drainage of the soil, the sunlight available. Once we plant a tree, we get a new connection to the earth that is carried with us throughout our lives. With the experience, we carry with us the feelings that surround the planting — feelings of wonder and celebration, feelings of cooperation and a sense of purpose, feelings of caring and concern.

Planting trees with your classroom requires some preparation to help the experience be most powerful for the students. The outline below can help you in developing a meaningful tree planting program.

A. Make a commitment.

Be clear that planting trees is what you really want to do and that the purposes are clear. Trees will grow and change the places where you plant them, so try to understand the nature of that change which will take place. Also, it is essentially a waste of time to plant trees without real purpose, only as an educational exercise.

B. Choose a site.

We have planted before on acres of cut over national forest land, have planted one tree in a city park, and have planted a few trees around our school yard. Once you have some sense of why you are planting and how far you can travel away from school, a good site is usually easy to find. Planting at school is a good place because of how it fosters a new sense of ownership and connection between students and their school. In choosing a site, it is good to explore the quality of the soil there. This, along with other factors like rabbits, dogs, bicycles and/or limited sunlight will determine how well certain kinds of trees will grow there. Investigating and choosing the site can be a fun activity for the students, from reading maps to studying soil to investigating land use in local areas. If you have the time and resources to go on a field trip to plant, there are some exemplary programs to contact. The Coos County ESD in the Southern Oregon Coast has a very well organized and creative tree planting program involving about 1000 students. You can get more information about their program by writing Karen Gartland, Coos County ESD.

C. Choose the trees.

It is best, for small plantings, to let the children decide the kinds of trees they want to plant, and do research to learn about them. A good tree picture book will help them visualize various kinds of trees, and a simple scavenger hunt or inventory on their way home from school will get

"If you are going to plant trees, plant them according to their nature. When trees are planted without regard to their special qualities, the places they create and the special energy they bring to us are often lost."

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them in touch with local trees. Once trees are chosen, we have found it easy to contact a local nursery and ask for a contribution of the trees you need. Often it is better to contact a nursery ahead of time to find out the kinds of trees they have available. A field trip to the nursery or to a tree farm is a fun way to explore young trees and seedlings. Once you've chosen your trees, it is best to have students write to the nursery and request the trees.

D. **Prepare for the planting.**

Most of the plantings we've done were more fun and powerful for everyone involved if some kind of ceremony was prepared. From writing individual pledges to writing and singing a song, a ceremony is a good means of getting more in touch with all the aspects of a tree. Preparation also includes finding tools you need for planting and any kind of other adult help, parents and local resource specialists. For some ideas on preparing your students by using their senses, see the "Start with One Tree" article in CLEARING No. 21.

In preparing, it is good to think about the educational context of the tree planting. Besides being a good program in and of itself, the planting can provide the background and enthusiasm for children's studies in art, music, science and social studies. The work we do to create a real, meaningful context is helpful in extending the experience. We are working now on a classroom extension program on trees and the earth, on forests, deserts and world culture, and on the state of the environment. This program has students initiate a connection with a classroom in another country, to begin to share our concern for our environment while we learn about another culture. It fits perfectly into our 6th grade world geography unit in social studies. We've also found it easy to shape our Arbor Day celebrations around our tree planting.

> "If you put a tree into the ground
> with a reasonable amount of care,
> it will grow. That's part of the
> aliveness of a tree. It has a will
> to grow. As tree planters, we become
> servants to that will."
>
> -Malcolm Margolin

STEPS TO PLANT A TREE

DIG A HOLE, one that is big enough for the entire root system of your young tree to fit comfortably with space around it. It is good to break up the soil in the hole a bit. In removing the soil it is best to keep the rich topsoil separate from the subsoil. Then putting a small amount of the topsoil in the bottom of the hole will help the roots establish themselves. The trees we plant, depending upon where they come from and how they are grown, will either be bare rooted, have a clump of soil around the roots, or be in a container. The trees like having some of the soil along in their new home from where they have been growing. With barerooted trees, this is the most difficult but if at all possible is quite helpful. In other cases, the trees will already have their soil with them.

PLACE THE ROOTS IN THE HOLE, pointing down as much as possible. The most important thing to remember is to keep the roots from drying out during planting from too much exposure to air. This is especially true when planting barerooted trees. If they have soil around them they tend to keep moist longer. Make sure the roots aren't tangled, turned up, or too cramped.

FILL IN THE HOLE, crumbling the dirt as you go, using the top soil first. Be sure to hold the tree so that the roots will be covered and the base of the trunk is at ground level. Continue crumbling dirt and packing it down with your hand. Make sure that you fill it back to a level even with the ground around it. Otherwise, it will puddle up with water and tend to drown the roots. Make sure the tree is snug in the hole by giving it a little tug.

Generally, barerooted trees will need more initial care than others and occasionally the trees will need protection and attention during the first year when possible.

Often it is advised to cover the tree with a mulch or ground cover to help it retain moisture and to feed it nutrients. Also, depending upon the conditions, protection may be needed from wildlife or domestic animals that tend to love eating young seedlings. Both of these, if possible, are a good idea.

— from Tree Song

African Women Union of Kenya Pledge —

BEING AWARE that our homeland is threatened by the expansion of desert-like conditions, that desertification comes as a result of misuse of the land by the indiscriminate cutting down of trees, bush clearing and encouragement of soil and wind erosion, that these actions result in drought, famine, malnutrition and death,

WE RESOLVE to cure our land by averting desertification through tree planting, building windbreaks, and keeping our rivers clean. We make a personal commitment to our homeland to save it from desertification by preventing drought, floods, famine, and soil erosion. In so doing we shall be ensuring a worthwhile heritage for our children and future generations.

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WINTER ADAPTATIONS

Every year in the midst of the rush of the holidays, we set one day aside to visit the mountain. It is a kind of retreat, a way to catch our breath from the incredible momentum of the season. So often, it is easy to get carried away by the activity around us and have little time left to sit and relax, to walk in the woods and listen to the stillness of winter. Each winter there is one day that belongs to the mountain, not so much to feel its excitement skiing or sledding, as to listen to what it has to say this year. And we realize it speaks more loudly in winter. That is the time of the mountain. The summer is reigned by rivers, but winter belongs to the mountains. (The mountain lies east of here, and on a clear day he is the lord of this place. We live on his shirttails.)

All throughout the late autumn, the mountain has been growing layer after layer of winter white, peeking out occasionally between dressings. These layers are the waters which will feed us and cool us when the hot July sun burns overhead. They are our hope for summer crops and creek beds. They accumulate on the mountain like our best new thoughts or songs waiting to be spoken when the season is right.

We took touring skiis and a thermos of soup and headed out on the trail with no real destination in mind. There is really no where to go when ski touring, only the going. The first quarter hour all I could hear was the skis against the snow (and when I stopped, only my heart pounding).

Then, that started quieting itself. We were getting deeper into the mountain, further from the road and the car and other people. Further from our lives, from the city and the holiday. Then while standing at the edge of a clearing looking out across the foothills, I was struck by the magnitude of what surrounded me. There wasn't a sound. No, occasionally there was a creak from a tree bending. But other than that there wasn't a sound. It was myself that was making all the sound I heard. And there was quiet all around me. It was like floating in the middle of a vast sea of quiet.

Then it dawned on me that the trees and snow and mountain around me were swallowing all noise. I remember one New Year's in the woods when a young boy blew a fire cracker nearby. "Where does that sound go?" I wondered. He turned to me. "The trees swallow it." Now I knew what he was talking about.

I hollered and the sound echoed until it was swallowed by the trees. Then I thought about what we had planned on doing that evening and my thought was somehow consumed by the trees.

Bit by bit the sound of my breath, my heartbeat, my thoughts, were all swallowed. And as each sound was swallowed, one more subtle, a little softer came to speak, and that too was swallowed. Quit becoming quieter. Inside the quiet, more noises to be quieted, until eventually I wasn't aware of any sound. In the midst of that emptiness, there was nothing to hear, a mountain sleeping and the quiet itself.

In the quiet, the last year fell away and the new year emerged before me. It was a subtle shift, not much more than a change in feeling, forgiving the lessons of the past year and feeling hope at the presence of the new one. What is born in me one moment in December comes to bloom in January, that special time in the seasons when we really stand between years. We can take a deep breath and fill ourselves with hope, ready to meet the challenges of the coming year. January for me is the trailhead on a new trail waiting to be explored and I prepare myself "in the spirit of undying adventure, perhaps never to return" as Thoreau puts it. For the challenges in the year ahead are going to ask me to change, to adapt, to become a part of the new seasons, to learn to fit in better. Standing on the edge of the new year, Thoreau's words came to mind.

That we may adapt to the new year and the movement of the earth as well as Thoreau proposes, that is the challenge ahead. While always keeping hope in our hearts and the enthusiasm that will help lead our children through the challenges they meet. For now though let us savor the emptiness and quiet of January as we prepare for the spring ahead.

A CLEARING Special Feature

GLOBAL AWARENESS

A Sense of Place

To become a citizen of the earth is to understand and celebrate our place in the world, our connection with others around the globe, our dependence upon the mother earth of our existence. Knowing other people, other cultures, helps us to understand our own people, our own culture, ourselves. Knowing other bio-regions on the earth helps us understand and celebrate our own bioregion.

Culture and Environment go hand in hand. Culture created out of its environs creates its environs anew.

This article is about how we use and manage our natural resources, our environment, mother earth in general, and create situations that affect our lives and culture. It is threads, collected from the four corners of the earth, and woven into one large story about our relationship to mother earth and our life support systems.

We hope this story can help us to understand our place in the world today, and work with our children to nurture their sense of place in the world, and their connection to the whole earth.

Teaching for the Earth

New Opportunities for Teachers

by Eric Swenson

As school districts throughout the Northwest establish criteria and develop curricula to meet the rising need for global studies in the schools, some patterns have emerged that are worth noting. The most important of these is the essential role that environment plays in global studies. Key words, understandings, and concepts necessary to the preparation of globally aware citizens repeatedly have environmental bases. While many specific goals of global studies courses naturally differ, the similarities include developing:

- **reverence for life**
- **appreciation of systems**
- **sense of the future**
- **awareness of interdependence**
- **acceptance of balance**

Teachers attempting to nurture reverence for life might begin with the study of what sustains life, exploring basic needs of food, clothing, and shelter, and their distribution in the world. The necessity of water to life, for instance, takes on added weight when one considers that two billion people today lack safe drinking water. Reverence for life is the foundation of abhorrence of war and could lead a teacher into peace studies and conflict resolution. Looking at life support systems, food, water, and energy, and the systems and cycles that underlie all life are as appropriate to global studies as environmental studies. Study of these cycles and the numerous examples of symbiotic relations that occur in nature give tangible meaning to buzz words like interdependence.

Helping students to accept the probability of drastic changes is another key goal for global educators. New technologies create new environments. Considering such technologies and the values they support or destroy reminds us that we have not so much inherited the earth from our parents as borrowed it from our children. Studying recent changes, imagining the future implications of our actions, can assist students and teachers alike in understanding the necessity of balance. The World Conservation Strategy and the UN Environment Programme both embody this balance in working towards development without destruction.

The rise of global studies presents environmental educators with a remarkable opportunity to extend their views, link efforts with teachers of other disciplines, and better prepare our children to be responsible citizens of the world. As we meet this opportunity, let us remember that, although there are many worlds, there is but one Earth, and that to understand these worlds, we need to understand our earth.

Bringing it all Back Home

by Tom McCall

Two weeks after the State of Oregon decreed Global Studies as a requirement for high school graduation, a World Conservation Strategy was announced in Washington, D.C., by high-level officials — and in 29 other countries on every continent of every political persuasion. The Strategy is the culmination of an intensive effort involving governments and more than 700 eminent scientists and experts from more than 100 nations over a period of more than three years.

Early March also brought an announcement by the Environmental Fund that the world's population had hit the four-and-a-half-billion mark, and that it's growing by 90 million a year. It will take us only 11 years to make the jump from four billion to five billion, compared with 14 years to move from three billion to four billion.

I think the juxtaposition of these events is too fortuitous to ignore and would like to suggest that educators trying to bring global studies into the classroom would do well to incorporate the findings of the Environmental Fund and the World Conservation Strategy. Let's document the point that that extra billion people aren't going to flood just India and Mexico. Let's drive home the statistic that a 2 percent population growth rate in 300 years will give the world a population density equal to that of New York City today. Sort of tells us that, ultimately, all across the world, we'll all be crowding into the same lifeboat together, that we'd better learn to get along with each other and to quit picking so extravagantly on the natural world.

It helps to visualize the Pacific Northwest as having much in common with developing countries. Isn't our region an exporter of raw materials like grain and lumber? Isn't it at a crossroads in its energy and industrial planning? Facing such questions as: Should the region expand its export of grain, fish and forest production as raw materials or as finished exports? Will more energy production and expanded payrolls, entailed by a decision favoring more processing — will they outweigh the costs, both monetary and environmental?

Although these considerations make the Northwest a rival of the Third World in some ways, it should also make the region more understanding of the Third World's economic problems, and pehaps more willing to lend a hand. That would epitomize to me "thinking globally and acting locally."

GLOBAL STUDIES

Perspectives

Taking Care of the Earth

by Rene Dubos

. . . When I talk at universities to students, they always want to discuss saving the globe, and I am all in favor of that, of course. But I always answer, "It's very good to think about problems in a global way. I think it is a good intellectual exercise, but the only way you can do something is in your own locality. So think globally, but act locally. If you cannot do something about that stream or those lovely marshlands in your town, then how do you think you are going to save the globe?

Toward global consciousness

During the 1970s, huge international conferences were organized by the United Nations to discuss the contemporary problems of humankind. These mega-conferences began with resounding statements of global concern and with clarion calls for international cooperation. As the meeting progressed, however, the discussions of concrete topics were usually diluted in a flood of ideological verbiage. At the end of a conference, efforts to set down a statement of consensus resulted in resolutions so broad in meaning that only a few of them could be converted into action programs. Yet, I believe that these conferences had a beneficial influence which was not apparent to me while I was involved in them.

"If you cannot do something about . . . those lovely marshlands in your town, then how do you think you are going to save the globe?"

They helped to generate a global awareness of certain dangers that are now threatening all nations. This is not a small achievement because thinking globally is not natural to human beings. Our intellectual and emotional processes are not adapted to a global view. It is only when people from all parts of the world listen to one another's problem that they realize how crowded we are on our small planet, how limited are its resources, and how multifarious are the dangers to which we are all exposed.

Environmental economics

Another contribution of the international conferences was to dramatize the diversity of conditions on our planet. While there was much posturing and propagandizing through the conferences, the delegates learned from their contact with representatives of other countries that global problems appear in a different light depending on the local situation. At the 1972 Conference on the Human Environment in Stockholm, the environmental purists discovered that abject poverty is the worst form of pollution and that poor countries have legitimate reasons to be more interested in economic development than in the ecological gospel. At the 1976 Habitat Conference in Vancouver, the delegates of poor countries complained of exploitation by industrialized countries, but nevertheless wanted to learn from them how problems of water supply, low-cost housing or sustainable rural development could be solved by advanced technologies.

World problems, neighborhood solutions

The most practical achievement of the international conferences may have been, however, to reveal that the best and often the only way to deal with global problems is, paradoxically, to look for solutions peculiar to each locality. Our planet is so diverse, both physically and socially, that its problems can be tackled with precision only by dealing with them at the national or, even better, at the regional level, in their unique natural and cultural contexts. Three examples will suffice to illustrate the necessity of the local approach to global problems.

The low cost of petroleum and natural gas, and the ease with which these fuels can be shipped and used anywhere in the world, were responsible until recently for the illusion that fairly uniform technological policies could be formulated for the planet as a whole. Fossil fuels, however, are becoming much more costly and soon will be in short supply. Different kinds of renewable sources of energy are being considered to deal with this situation. For example, nuclear fission, solar radiation, the biomass, the wind, the tides, the waves, etc. Each one of these sources of energy has advantages and objections peculiar to it and, unlike petroleum and gas, each one is much better suited to one natural or social condition than to others. Solar radiation has a better chance to be developed on a large scale in highly insolated areas — the biomass in densely wooded areas — the wind where it blows in a fairly dependable manner — coal where the pollution it causes will be least objectionable — nuclear fission in industrialized countries that are most deficient in other energy resources and where the public is therefore most likely to accept the risk of massive unpredictable accidents. Just as the shift from hydroelectric power to coal, then to petroleum and gas, made certain heavy industries move from New England to the Appalachians and then to Texas, so we can anticipate that there will be many different local solutions to the global energy problem.

Abject poverty is the worst form of pollution.

Desertification (referring not to natural deserts, but to areas which are rendered desertic by human activities) is a problem of increasing gravity in many parts of the world. In an attempt to control the spread of desertification, the United National Environmental Programme (UNEP) first formulated programs which were transnational, in the sense that they dealt with vast, continuous areas of deserts stretching across several countries. However, this plan has been abandoned because the human practices leading to desertification differ from country to country. The desert unit of UNEP has recently decided that before receiving international help, the individual countries should create their own projects fitted to their particular social conditions.

The recommendations of the Habitat Conference were fairly explicit with regard to supplies of clean water or of decent shelter, because these biological necessities can be defined in scientific terms. In contrast, the recommendations were quite vague with regard to cultural matters or quality of life because these values have intense local and individual characteristics that transcend scientific determinism.

Hazards of globalization

In my opinion, it is fortunate that practical necessities will compel a local approach to global problems. Globalization would mean more standardization and therefore less diversity, which, in turn, would slow down the rate of social innovation and of qualitative growth. Another danger of globalization is that excessive interdependence of systems increases the likelihood of collective disasters if any one of the subsystems fails to function properly as a result of accident or sabotage.

Finally, we may soon reach a state, if we have not reached it already, at which the technological, economic and social systems become so huge and so complex that the human mind cannot cope with their comprehension, let alone their management. There is a better chance for creativity, safety and manageability in multiple, fairly small systems, aware and tolerant of each other, but jealous of their autonomy.

E pluribus unum

Skepticism concerning the value of globalization does not imply isolationism. There are good reasons to believe that we can create a World Order, not a World Government, in which natural and social units maintain or recapture their identity, yet interplay with each other through a rich system of communications. This is beginning to happen through the 16 specialized agencies of the United Nations, such as the World Health Organization, the World Meteorological Organization, the Food and Agriculture Organization, the UNEP, which I mentioned earlier. My hope is that we shall learn to create for humankind a new kind of unity out of ever-increasing diversity.

> ***The ancients believed that the earth was a living being that felt the actions of people upon it. I submit that since we have no scientific evidence to the contrary, we accept this view and behave accordingly.***
>
> **Richard St. Barbe Baker**

Two Great Crisis

Our era is characterized by two great interrelated crises. The solutions we find for one are dependent on the solutions we find for the other. Both crises are global in nature, but also local and immediate; they involve us as individuals while encompassing humanity collectively. Ultimately, the quality of our lives depends on our ability to acquire knowledge and skills, and the will to deal with these crises.

The Crisis of Habitat

The first of the crises, *the crisis of habitat*, results from profound changes in the nature and use of our life space. We no longer live in self-sufficient communities or on continents isolated from others by oceans of air or water. Earth, its seas, waterways, and air, its lands and their uses, have become **planetary commons**, shared by all of Earth's inhabitants; abuse or overuse by any one group can affect the quality of life of every other resident of the globe.

Signs of this crisis of habitat, the deterioration of our environment, can be photographed, weighed, measured, charted, or otherwise quantified, and has been widely publicized. Much energy is devoted to describing, decrying, and documenting pollution and the disappearance of many non-human forms of life. There is also concern about other aspects of the crisis — that we are running out of certain natural resources, that the human species might self-destruct through its nuclear capabilities, and that the planet's ability to support so many billions of people is limited.

Unfortunately, publicity has created little real understanding. Beyond an awareness of the symptoms, such education has not led us to participate effectively in a search for the solutions on which our personal and collective well-being depend.

Our lack of awareness of the complexities of the crisis leads to confusion and inhibits us from constructive response. Reactions to the recent skyrocketing of coffee prices provide a good illustration. The initial response was a boycott on the part of thousands of angry consumers, thinking some conspiracy must be afoot. Beneath the surface, the complex chains of circumstances involved provide a clear illustration of our interrelatedness. Some of the factors include: the freeze in Brazil; civil war in Angola (the world's fourth largest coffee exporter); coffee exporting countries beginning to tax every bag of coffee going out of the country (a move encouraged by the U.S. government in the hope of reducing foreign aid commitments); the U.S. ban on the export of soybeans (intended to reduce the prices of cattle feed), which forced Japan, who is highly dependent on U.S. soybeans for protein, to look elsewhere and encouraged many coffee growers in Brazil to replace their trees with more profitable soybeans.

Such complexity is not unusual. Almost every issue making up the crisis of habitat is characterized by this phenomenon.

An important first step in understanding the true nature of this crisis of habitat is education about the environment — including knowledge and skills related to ecology, economics, decision making, career choices, and so on. But this alone is not enough to resolve the crisis, because this first crisis is interrelated with a second crisis, **the crisis of being human.** It involves our feelings of self-worth and efficacy, our relationships with others, our will to act, our values, ideals and institutions.

The Crisis of Being Human

Although this crisis isn't as visible, it nevertheless exists. It is evidenced by widespread skepticism and disillusionment. Doubting our leaders and questioning the viability of our institutions, we often despair about our capacity to solve our most pressing social and economic problems. Within this crisis is the feeling that we as individuals do not really make any difference, that our lives may be without significance.

Alternately, this crisis can manifest itself in an ostrich-like complacency. If protected by a comfortable income and surrounded by material comforts, we can develop the notion that all is right with the world, that we can isolate ourselves and thereby not participate in the situations in other parts of the world. When we try to exist in such isolated shells, it is easy to lose the will and ability to cope with the crisis of habitat. Thus, congested freeways, poisoned air, damaging noise come to be viewed as nuisances to be endured.

We cannot afford either blind complacency or a sense of despair. We must be able to recognize our crises and develop the will to deal with them. We must avoid overemphasis on the catastrophic, while we need reminders that a crisis is not just a predicament, a condition. A crisis is also a turning point, a juncture, and an opportunity for change. This change can come in caring for oneself and for others, through recognition of others' concerns and perceptions, accepting responsibility for our actions — a recognition that those actions ripple out through time and space, touching the lives of others now and in the future.

Intercom #86,
Center for Global Perspectives

TREES AND DESERTS

Global Perspectives

Students and teachers in the Pacific Northwest have enviable opportunities for learning about forests and deserts. Few places in the world exhibit the remarkable changes of climate and habitat evidenced in Washington and Oregon. One can travel in a day from high desert and rangeland, from the wide expanses of sparsely vegetated antelope country to the densest concentration of organic matter in the world, the rain forests of Western Washington. The relationship between forests and deserts is an important one. As forests are removed for fire or pulpwood, or mining or housing, all too often they are being replaced by deserts. The following articles help us to visualize this development.

E.S

WHERE HAVE ALL THE FORESTS GONE?

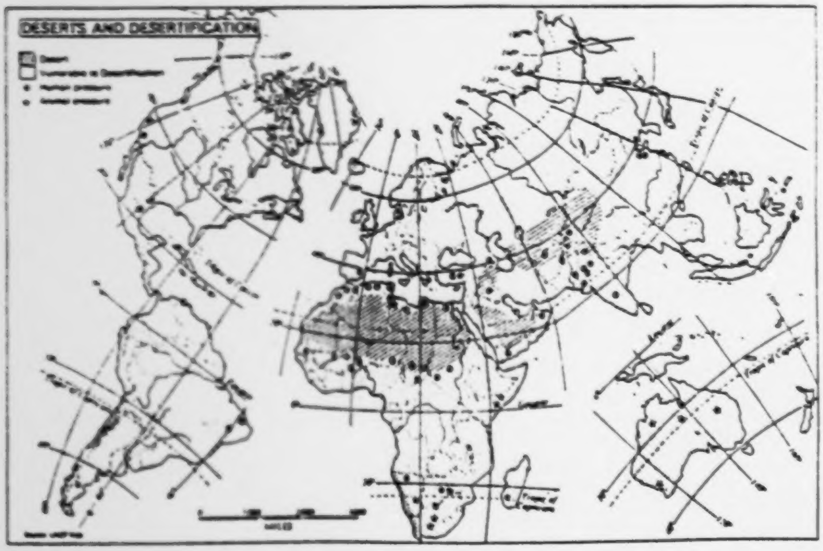
A ring of trees 80 miles wide has been stripped to feed the cooking fires of the capital of Upper Volta. Slash-and-burn farmers have reduced most of upland Haiti to a rocky skeleton. Brazilwood is vanishing from Brazil, where the smoke of a torched jungle rises thousands of feet above the Amazon.

By axe, bulldozer, chain saw and fire, the world's trees are falling — far faster than nature or man is replacing them. Up to half the world's woodlands may have vanished since 1950, and yearly losses run from 25 million to 50 million acres. "A forest the size of Cuba is being destroyed each year," says Erik Eckholm, an environmental expert who until recently worked with the U.S. State Department's Office of Policy Planning. "At that rate, only scattered remnants of virgin forest will remain by the end of this century."

The global assault on forests carries a disaster potential equal to the better-known crises in food supplies and fuel — and no one will escape the effects of a balding earth, whether through critical shortages of paper and plastics or, at worst, through destructive climatic change.

In the great tropical greenbelt, poverty and lack of effective controls have combined to force a grim war on trees. Two-thirds of Latin America's original forest is gone or seriously depleted. Half of Africa's woodlands have disappeared. Thailand has lost one-quarter of its forest in the last 10 years, and the Philippines, one-seventh in the last five. Patches of the Amazon, central Africa and the Himalayan foothills have taken on the moonscape look of northern Africa and the Middle East. Says Eckholm, "The world's poorest people are being forced by circumstances beyond their control to destroy their future."

The issue goes far beyond millions of acres of lost trees. Land haphazardly cleared for farms and grazing — the single leading cause of deforestation — typically replaces rich jungle with hard-baked scrub. Hills stripped for firewood — the principal fuel for three-fourths of humanity — cause floods that ravage lowlands.



When the Third World reaches the end of its trees, it may also reach a far more calamitous dead end to further development. Sub-Saharan Africa is a dramatic example. From Tanzania to the Ivory Coast, millions of smoking home fires have chewed barren holes in the jungle. As trees thin out, women in eastern Africa spend up to six days a week keeping their families in cooking wood. In western African cities, it often costs more to heat a pot than to fill it.

> **"The accelerating destruction of forests throughout Africa, Asia, and Latin America caused in part by fuel gathering lies at the heart of what will likely be the most profound ecological challenge of the late 20th century."**

Under similar pressures, the topsoil of an increasingly uprooted Nepal washes out of denuded valleys to disappear forever downriver. The problem is even worse in India, where more than six billion tons of topsoil — 10 tons for every person in the country — slip away each year.

Southeast Asia's jungles are also rapidly falling victim to slash-and-burn agriculture. Farmers cut and clear a section of the forest, plant their crops for several years until the soil is exhausted, then move deeper into the forest to repeat the process. Commercial

WHAT MAKES TROPICAL RAIN FORESTS SO SPECIAL?

Tropical rain forests are the greatest, most enduring celebrations of life ever to have evolved on this planet. No other land environment has so many species of plant and animal. A hectare (2.45 acres) of temperate woodland, for example, normally contains an average of 10 different species of tree 10 centimetres (almost 4 inches) and upwards in diameter. Even the most diverse non-tropical forests, like those of the Appalacians or the 'cove' forests of South Carolina, contain no more than 25 species. By contrast, a hectare of tropical rain forest generally contains more than 100 species of large tree. Very rich areas, like the lowland forests of the Malay peninsula and Amazonia, boast more than 200 species.

The profusion of plants and animals is remarkable. In the forests of south-east Asia, there are estimated to be more than 25,000

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In the time it takes to read this sentence, *six acres* of forest will disappear.

forces are also at work. Nearly two-thirds of the world's hardwood comes from Southeast Asia. But logging has been so extensive that virtually all the lowland forests in Malaysia and the Philippines will be cut over by 1990. Thailand, once a leading producer of teak, will spend more than $100 million this year to *purchase* wood products from abroad.

Only sheer size has so far kept the Amazon region from a similar fate. From the Andes to the Atlantic, its dark carpet forms the world's largest continuous tropical forest — equal in size to the continental United States. The Amazon's timber reserves could supply world needs for 20 years at current rates of consumption. Two-thirds of the jungle is still intact, but the Amazon is gradually being gnawed around the edges and eaten away from within. Peru hopes to settle two million peasants in the jungle over the next five years, and Ecuador hopes to open up gas and oil fields, with pipelines to be pushed through the forest to the coast.

Brazil has done the most damage, particularly with the Trans-Amazon Highway that a decade ago opened the interior to large-scale exploitation. More than seven million acres were cleared to build the highway and secondary roads.

What does all this devastation mean for the world? Scientists studying the effects of deforestation on weather see two conflicting outcomes. One group predicts a global warming trend, spurred by the "greenhouse" effect of carbon dioxide released when woodlands and fossil fuels are burned. Their worst-case model foresees a two-degree rise in average temperatures over the next 70 years, melting the polar icecaps and raising sea levels more than 20 feet. "This is speculation," admits George Ledec, formerly of the Natural Resources Defense Council. "But by the time we have hard evidence, it may be too late." Others believe that by making the earth's surface "shinier," lost forest cover may increase reflection of sunlight and lower temperatures worldwide. A secondary effect could be shifting rainfall patterns, bringing permanent drought to the great farming regions of North America and Europe.

The vicious spiral of too many people depending on too few trees can sometimes be slowed, or even reversed. Europe and North America have larger and more productive wood reserves than a century ago, and scientists are continually devising better forest-management techniques.

The challenge, however, is not just to plant more trees. The only sure way to stop deforestation is to minimize the things that cause it — lack of fuel, fodder and farmland for the 500 million people who live on the edge of starvation. Without such programs, millions of seedlings and thousands of acres of fenced-off preserve will be so much chaff in an ever more desolate wind.

Newsweek

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species of flowering plant, and 49 per cent of the genera (the main groups of species) represented are found nowhere else. Of the 660 different species of bird known or presumed to breed in the Malay peninsula, 444 are restricted to the rain forest.

In a single hectare of Costa Rican forest, 269 bird species were observed, and in one locality in Peru, 410 were monitored. The total number of bird species found in the rain forests of central America is more than four times higher than that of the temperate forests of the eastern United States. Insects, amphibians and many other animals abound in equally impressive numbers.

Some of the tropical rain forests are many millions of years old. Fossil deposits of pollen from the late Pliocene period have been found off the coast of Borneo and shown to be from the same genera of trees growing today in the Johore swamp forest of western Malaysia. So in some parts of south-east Asia, the forest has had a continuous history, on much the same site, since the flowering plants began.

As Professor Paul Richards has pointed out: 'The destruction in modern times of a forest that is millions of years old is a major event in the earth's history. It is larger in scale than the clearing of the forests of temperate Eurasia and America, and it will be accomplished in a much shorter time.' In many cases, the plants that are doomed to disappear with the destruction of the forests of which they are part are undescribed or even undiscovered. The richest lowland areas are the most vulnerable. The plant communities of Malesian tropical rain forests (the Malesian floristic region embraces Malaysia, Indonesia, the Philippines and New Guinea) are the most species-rich in the world, but those of the Philippines and Malaysia are expected to have vanished completely within a decade. The loss will be irreparable.

How to Save the World

Resources

The Worldwatch Papers. Produced by the Worldwatch Institute, an independent, non-profit research organization established to alert policymakers and the general public to emerging global trends in the availability and management of resources — both human and natural. Available individually at $2 (single copy) or by subscription ($25/year) from the Worldwatch Institute, 1776 Massachusetts Ave. NW, Washington, D.C. 20036.

- #13 *Spreading Deserts — The Hand of Man.* By Erik Eckholm and Lester Brown
- #26 *Planting for the Future: Forestry for Human Needs.* By Erik Eckholm
- #42 *Wood: An Ancient Fuel With a New Future.* By Nigel Smith

My Life, My Trees. Richard St. Barbe Baker. Findhord Publications, 1979. The story of the remarkable life of Richard St. Barbe Baker, the Man of the Trees, who has dedicated his life to spreading the message of man's dependence on trees for his survival. St. Barbe, currently 92 years of age, has traveled throughout the world urging people to "plant trees for their lives."

Deserts and Men. A scrapbook by Matthijs de Vreede that takes a look at the increasing land area of the world that is becoming barren due to man's impact. Full of color photographs, the book focuses on the plains of Africa, where overgrazing and deforestation are enlarging the desert at an alarming rate. Government Publishing Office, The Hague, Netherlands. 1977.

Firewood. A 15-minute film that shows the plight of Third World people as they struggle to maintain their lives in the face of a massive shortage of fuelwood. Available on loan from the U.S. Forest Service.

Environmental Education Report. Published monthly by the Center for Environmental Education, 624 9th St. NW, Washington, D.C. 20001. Perspectives and information in the field of EE. Volume 9, No. 9 (October 1981) focuses on global deforestation, tropical forests, and efforts being made around the world to halt the destruction of forest habitat. Copies available at $2.50 apiece.

ENERGY

Global Perspectives

THE FIREWOOD CRISIS

For a third of the world's people, firewood is the primary energy source. About half the world's yearly timber cut is used for essential cooking and heating. In recent years, the huge and growing demand for firewood has led to a shortage. The result is an energy crisis that brings with it at least as many related problems and dangers as the energy crisis involving fossil fuels.

In a recent book, *Losing Ground: Environmental Stress and World Food Prospects* (W.W. Norton and Co.), the firewood shortage exists, says Erik Eckholm, for two major reasons. First, the population of wood-using people has been rising at a rapid rate. Second, forests are being cut down faster than they are growing back. The first and most obvious result of the shortage is hardship for those who need wood. These range from city dwellers to rural villagers, most of them living in Third World areas — Asia, Africa, and Latin America. For city people, the firewood shortage means higher prices.

Unlike the fossil fuel situation, there is hardly any "fat" to be trimmed in the demand for firewood. Gasoline users might be able to cut back on using the car for fun, or double up in car pools for work. But firewood users need an unchangeable amount of wood each day if they are to cook dinner and stay warm. The result is that when there is no money to buy wood, or no wood available to gather, people are forced to burn what they can (such as garbage or dung), or to steal wood from areas where trees are supposed to be protected. The desperate search for firewood has led to deforestation in the border areas of the Sahara Desert, and also in such unlikely spots as the Himalayan foothills, and in parts of China where, says Eckholm, "trees on commune plantations are sometimes uprooted at night for fuel almost as soon as they are planted."

The accelerating destruction of forests throughout Africa, Asia, and Latin America caused in part by fuel gathering lies at the heart of what will likely be the most profound ecological challenge of the late 20th century.

"The accelerating destruction of forests throughout Africa, Asia, and Latin America, caused in part by fuel gathering, lies at the heart of what will likely be the most profound ecological challenge of the late 20th century — the undermining of the land's productivity through soil erosion, increasingly severe flooding, creeping deserts, and declining soil fertility."

Problems come when people turn to an alternative form of fuel such as dung. Handmade dung patties burn well and are nearly odorless. Use of them has been spreading in India and Pakistan, and they are also being burned in Bolivia, Peru, Iraq, and Ethiopia. The problem is that when manure is burned, it is not available to fertilize the earth for growing food crops. The cycle of human hunger, cold and desperation is only reinforced.

Intercom #98

DIMENSIONS OF THE FUELWOOD CRISIS

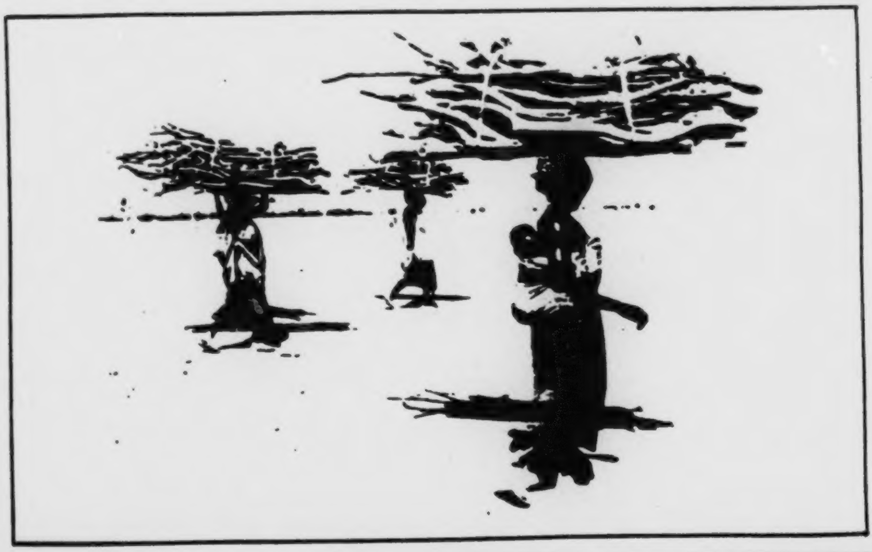
To appreciate more fully the dimensions of "the other energy crisis," sometimes called "the poor person's energy crisis," consider these facts:

Firewood is the only source of heat for cooking food and heating water for about one and a half billion people in the world today. They consume an average of a ton per person per year in the course of satisfying their minimal needs. Thus, consumption of firewood now equals about one and a half billion tons annually. As populations continue to increase, however, so, too, will the need for firewood and the amount consumed.

Wood that once took hours to gather now requires days. As scavenging for wood becomes more difficult, the price skyrockets. Fuel for cooking today is a major expense for tens of millions of people who can least afford it. In Katmandu, for example, the price of a load of firewood has tripled in the last several years. A bag of charcoal now sells for more than $4 in Addis Ababa, while the average annual income per capita in Ethiopia is a mere $100. And in the drought-plagued Sahel of West Africa, the average family now spends one-fourth of its income on firewood.

In many parts of the world — Sudan, Pakistan, and South Korea are examples — wood gatherers not only take every tree and sapling they can find, they rake twigs, seedlings, leaves and litter from the soil as well. Leaving the forest floor bare, they interfere with the natural reseeding processes. They do still further damage by robbing the soil of its protective cover, leaving it to be washed away by rains and winds.

Deprived of firewood, millions now depend upon the dung of camels, llamas, and cattle. This diversion of animal dung from agriculture to heating and cooking purposes has far-reaching and sinister consequences. It reduces solid fertility and crop yields. Thus less food is produced at the same time that the population is growing and more food is needed. The danger of famine increases, so, too, does dependence on other nations. In short, a vicious circle of hunger, poverty, dependence, and despair is created.



Gathering firewood for cooking in arid regions has resulted in widespread deforestation.

WORLD ENERGY RESOURCES HAVES AND HAVE-NOTS

The fuels shown here account for about 94 percent of the world's energy production — 297 quadrillion Btu's in 1979. Coal fills 27 percent of the global energy budget — a rate of use that would not deplete known reserves until the 22nd century. Oil supplies some 134 quads a year — a rate that would exhaust present reserves in about 30 years. But oil consumption continues to rise; many experts think it will peak around the year 2000 at about 165 quads — exhausting known resources much sooner.

Some geologists estimate that yet-to-be discovered deposits of oil and gas will equal present reserves. New coal resources may double those we now know of, while uranium may exist in quantities several times the proved reserves.

Nature was not democratic in dispersing its wealth. Many areas of south Asia, though teeming with people, are energy starved. The vast interiors of Africa and South America appear as fossil fuel deserts. These regions, however, have been little explored.

The industrialized regions to the north, rich in coal and uranium, are also comparatively well off in oil — the U.S.S.R. being the world's largest producer, and the United States number three, after Saudi Arabia. There are critical exceptions: Japan must import 90 percent of all its energy, while Western Europe — whose only significant oil lies in the North Sea — imports more than half. As energy resources rise in value, they gravitate to the developed nations, mostly in the north, where only a quarter of the world's people enjoy some 80 percent of its wealth. The growing disparity between these nations and the poorer ones to the south has spawned a "north-south" dichotomy in world politics.

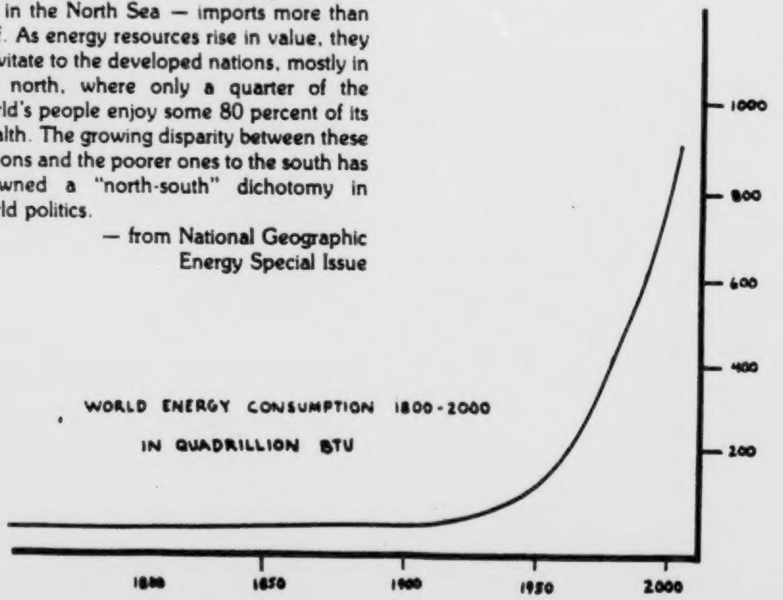
— from National Geographic
Energy Special Issue

WORLD ENERGY STRATEGIES

What are you going to heat your home with in 1995? For 10 years, a furor has raged over what energy sources we will need and have in the future, and what the demands will be. Energy debate jargon has intimidated some; it shouldn't. **World Energy Strategies** introduces the options available to us with producing and promising technologies. The merits and hazards of employing each technology are evaluated in a clear language.

Author Amory Lovins, a proponent of what he calls the "soft energy path," treats all energy sources fairly and saves his advocacy for the "issues" section. The book addresses both sources of power and expected energy needs, and why each of us must involve ourselves in the inevitable solution. "If per capita energy use in the USA were reduced to that of, say, France, the amount 'saved' would suffice to give everyone else in the world nearly a fourth more energy than he now has." In less than 150 pages, Lovins clearly introduces facts, issues, and options of the energy decisions ahead.

Amory B. Lovins
Harper & Row, 1973



World Energy Survey. Ruth Leger Sivard. World Priorities, 1981. $3.50. Summarizes current and world energy situation. Offers valuable information, charts, graphs, etc. Looks at energy use of the past, relating energy and population and development, as well as energy in the future in terms of demand projections and supply projections. Outlines various means for action on energy future.

Worldwatch Paper #4: Energy: The Case for Conservation. Denis Hayes. The Worldwatch papers are produced by the Worldwatch Institute, an independent, non-profit research organization created to analyze and to focus attention on the global situation. $2.00 from the Worldwatch Institute, 1776 Massachusetts Avenue, N.W., Washington, D.C. 20036.

Energy for Survival: An Alternative to Extinction. Wilson Clark. Garden City, N.Y.: Anchor Books/Doubleday, 1974. Examines energy policy and potential, analyzing the ramifications of current dependencies as well as political and economic obstacles between the present crisis and successful harnessing of the sun, the wind and the earth's heat.

Energy Education. Intercom #98. Global Perspectives in Education, Inc. 1980. $1.75. Background articles, teaching suggestions, simulation and classroom materials which give a global perspective to the complex energy issue. 218 East 18th St., New York, N.Y. 10003.

Worldwatch Paper #1: The Other Energy Crisis: Firewood. By Erik Eckholm. $2.00. Produced by the Worldwatch Institute, 1776 Massachusetts Ave. N.W., Washington, D.C. 20036.

A Time to Choose: America's Energy Future. The final report of the Energy Policy Project. Ballinger. Cambridge, Massachusetts. October 1974. EPP, 1755 Massachusetts Ave. NW, Washington, D.C. 20036.

Intercom #73. *Intercom* is a periodical publication of the Center for Global Perspectives in New York. Issue #73 includes *The Energy Question: Problems and Alternatives*, a look at global energy use patterns and possible alternatives. Copies available at $1.50 for single copies: 218 East 18th St., New York, N.Y. 10003.

FOOD AND HUNGER

Global Perspectives

AGAINST THE GRAIN

(At present rates, one-third of the world's cropland will have disappeared within twenty years)

Since the day in April 1961 when Soviet cosmonaut Yuri Gagarin circled the earth in spacecraft Vostok I, the term "life-support system" has become common currency. By a life-support system is meant a combination of supplies and devices which enables man to live and work in an environment, such as a spacecraft or a submarine, in which he could otherwise not survive. Man needs an atmosphere he can breathe and supplies of water and food as well as a means of waste disposal. On "spaceship earth," the most important life-support systems which provide these elements are agricultural systems, forests, and coastal and freshwater systems. Today, these life-support systems are under serious threat.

Only about 11 percent of the world's land area (excluding Antarctica) offers no serious limitation to agriculture; the rest suffers from drought, mineral stress (nutritional deficiencies or toxicities), shallow depth, excess water, or permafrost.

The world's cropland currently occupies 14 million km^2, and although it may be possible to double this area, much of the best land is already being farmed. Unfortunately, large areas of prime-quality land are being permanently taken out of agricultural use by being built on.

In developed countries, at least 3,000 km^2 of prime agricultural land are submerged every year under urban sprawl: between 1960 and 1970, Japan lost 7.3 percent of its agricultural land to buildings and roads, and European countries lost from 1.5 percent (Norway) to 4.3 percent (Netherlands).

Soil is a crucial life-support system, since the bulk of all food production depends on it. Soil erosion is a natural and continuous process, but in undisturbed ecosystems with a protective cover of plants, the soil is usually regenerated at the same rate it is removed. If soil and vegetation are not in balance, as often they are not when influenced by poorly managed human activities, erosion is accelerated with disastrous consequences.

Even under natural conditions of vegetation cover, nature takes from 100 to 400 years to generate 10 millimeters of topsoil; and 3,000 to 12,000 years would be needed to generate soil to a depth of the length of this page. So once the soil has gone, for all practical purposes it has gone for good.

Soil loss has accelerated sharply throughout the food-hungry tropics, which are generally more susceptible to erosion than the temperate zone, due to the topography of the land and the nature of the soils and rainfall.

More than half of India, for example, suffers from some form of soil degradation: out of her total of 3.3 million km^2, 1.4 million km^2 are subject to increased soil loss, while an additional 270,000 km^2 are being degraded by floods, salinity and alkalinity. An estimated 6,000 million tons of soil are lost every year from 800,000 km^2 alone; with them go more than six million tons of nutrients — more than the amount that is applied in the form of fertilizers. It is estimated that close to one-third of the world's arable land will be destroyed in the next 20 years if current rates of land degradation continue.

The productivity of agricultural ecosystems depends not only on maintaining soil quality, but also on retaining the habitats of beneficial insects and other animals, such as crop pollinators and the predators and parasites of pests.

Effective pest control is no longer a matter of heavy applications of pesticides, partly because of the rising cost of petroleum-derived products but largely because excessive pesticide use promotes resistance (the number of pesticide-resistant insects and mites has doubled in 12 years), destroys natural enemies, turns formerly innocuous species into pests, harms other non-target species, and contaminates food and feed. Instead, pesticides should be used to supplement a battery of methods integrated in appropriate combinations: these methods include introduction of pest-resistant crop varieties, special planting combinations and patterns, mechanical methods, the use of repellents and hormones, and encouragement of natural enemies.

UNESCO Courier

VIEWS OF HUNGER

The three major issues of today are food, population and energy. A discussion of one of these issues must at least mention the other two, since they are highly interrelated.

The world food system is not working adequately for most poor countries and some people in rich countries. Large numbers of people are hungry and malnourished. While exact figures are not available, and while we cannot yet agree fully on what proper nutrition consists of, it is estimated that for the world 16 percent of the population is below lower limits of protein and energy supplies. There is increasing evidence that the world food problem must be viewed not only in terms of the quantity of food available but also in terms of quality (nutrition) of food available. There is evidence that malnourished babies have smaller brains than well-nourished ones. They lag behind in intellectual performance and, unfortunately, never catch up no matter how much their diets may improve after age two or three. These findings magnify the world food issue.

The immediate cause of hunger is the lack of resources with which to buy or produce enough food. Insufficient food interacts with disease, apathy and other effects of poverty to foster malnutrition and lower productivity.

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on-food imbalance might be
reased production and con-
ng in more food availability

– **Ludwig Eisgruben**
OSU

Teaching about Food and Hunger, 33 Activities. (grades 6-12). George G. Otero and Gary R. Smith. $8.95. Encompassing a wide variety of activities in areas of discovery skills, values, values clarification, as well as knowledge of food issues and related concepts. From the Center for Teaching International Relations, University of Denver, Denver, CO 80208.

United Nations Association has two resources helpful to learning about world hunger: **World Food and Hunger: Discussion and Study Guide.** 25c each, and **Select Bibliography on World Hunger and Development.** 25c each. This includes listings of books, kits, manuals, games, publications and organizations, as well as films. 300 East 42nd St., New York, N.Y. 10017.

Losing Ground: Environmental Stress and World Food Prospects. By Erik Eckholm. An important book that looks at the impending ecological disaster predicated upon current global trends. Available at local bookstores. Erik Eckholm is currently a Senior Researcher at the Worldwatch Institute.

The Many Perspectives of Hunger*

ciplinary ckground of bserver	Diagnosis of main causes of hunger in a society	Typical recommendations for solution
	Nutritional disorder Environmental stress Disease	Vaccination Breast feeding, weaning food Environmental sanitation
e	Low food supply	Food production Food aid Post harvest technology Marketing
	Ignorance Food habits	Nutrition education Mass communication
on sciences	High population density High population growth rate	Population control Resettlement
cal economy	Maldistribution of food	Fiscal policies Income-generating projects Employment programs
economy	Capitalism	Revolution
rs	Lack of planning and coordination	Food and nutrition councils Training

*Problems examined in a mono-disciplinary way tend to be attacked with mono-disciplinary actions. Some of the more common reductionistic approaches to the problem of hunger are listed here. The table exaggerates the situation, as most people try to broaden their views beyond their disciplinary backgrounds and recognize the need for multifactorial approaches.

From "The Basic Causes of Hunger," *Food and Nutrition Bulletin*, Vol. 3, No. 2.

Food First: Beyond the Myth of Scarcity, by Frances Moore Lappe' and Joseph Collins with Cary Fowler. New York: Ballantine Books. 1979. $2.95. Recommended for high school level and up to understand the complexity of the issue of world hunger and its relevance in our lives. Well researched and documented with extensive bibliography and list of action groups.

Hunger: The World Food Crisis. Kathryn Mervine Flowler. (An NSTA Environmental Materials Guide. National Science Teachers Association. 1977) $2.50. Annotated reading and audio visual materials on world hunger listed according to grade level (K-12). Helpful ideas for science, home economics, social studies and language arts. NSTA 1742 Connecticut Avenue, NW. Washington, D.C. 20009.

Food First Resource Guide. $2.95. Point-by-point outline of the causes of hunger and the diverse approaches to food security. Provides selected documentation from around the world and the complete information needed to acquire that documentation.

Presidential Commission on World Hunger. $2.00. Summarizes the final report of the Presidential Commission on World Hunger with critique and study materials.

Diet for a Small Planet. (Completely revised and updated) Frances Moore Lappe'. Ballantine Books $2.50. Advocating a high protein, meatless diet and food choices which make the most of the earth's capacity to supply the vital nutrient protein, this book gives a technical approach to international cooking including charts, tables, graphs, appendices, notes and recommendations for further reading.

World Watch Paper #9: The Two Faces of Hunger. By Erik Eckholm and Franck Record. From the Worldwatch Institute, an independent, non-profit research organization created to analyze and to focus attention on global problems. $2.00. 1776 Massachusetts AVe. N.W., Washington, D.C. 20036.

Energy, Food and You: An Interdisciplinary Guide for Elementary and Secondary Schools. Ideas and activities on global food problems, energy and resource use in the U.S. food system, and energy-efficient nutrition. Available from the Washington State Office of Public Instruction, Olympia, WA.

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WATER AND OCEANS

Global Perspectives

DECADE FOR WATER

"If there is magic in the world, it is contained in water," wrote a Tao poet. Providing enough water for everyone in the world by 1990 is the United Nations' goal for this decade.

The International Drinking Water Supply and Sanitation Decade "offers the possibility for achieving as great a change in the quality of human life as any program ever launched by the United Nations," says the UN coordinator, Dr. Peter G. Bourne.

Kurt Waldheim, then-Secretary General of the UN, kicked off the world-wide effort a year ago as new figures grimly pointed out the need for such an effort:

- Eighty percent of all diseases are water related.
- Water-borne diseases killed more than six million children under 5 years old in 1979.
- Over 650 million people suffer from debilitating water diseases that include gastroenteritis, chistomiasis, and river blindness.
- Half of the people lying in hospital beds are suffering from water-borne diseases.

Viewed from the Pacific Northwest, it appears to be a distant problem. How could 25,000 people a day die from water-borne diseases? How could New Delhi, India, become so polluted from sewage and industrial effluent that the water is unfit even for gardens? The typical American family of four uses approximately 225 gallons of water a day. That's more fresh water than many humans will drink in their lifetime.

The United Nations estimates $92 billion will be needed by 1990 to meet clean water goals. Another $40 billion will be needed for sanitation development goals. This $132 billion could provide enough clean water for drinking, cooking and preparing food, bathing, washing clothes, and in some cases watering gardens and livestock. If the goals are achieved, over half the infant deaths could be ended; the health and economic status of the earth's one billion impoverished people would be dramatically improved.

In the next 10 years, the U.S. will specifically involve itself through three agencies: the International Development Cooperation Agency (IDCA) will develop policy and coordinate bilateral assistance programs; the Agency for International Development (AID) will be the primary operating agent for bilateral assistance, using technical expertise and funds to work with; the Peace Corps, whose community-based practical experience will be necessary.

Rural and semi-urban water supply and sanitation have been identified by AID and the Peace Corps as their top priorities. The U.S. strategy is to improve primary health care and increase food supplies with water projects. Supplying funds, materials, and technicians won't be enough to meet the goal. Training village workers to monitor and maintain facilities will be equally important. Tailoring the program to community needs and resident abilities will yield appropriate technology — essential to the success of the Decade goals.

Reagan's administration intends to involve the private sector with AID's Water and Sanitation for Health (WASH) Project. WASH is a mechanism for host countries to draw upon U.S. private-sector technology. Educating the local communities to bring about technical competency will be a major goal of WASH. Even with all the state, federal, and private agencies involved in the water Decade, the goal is ambitious. Can it succeed with the competition of a growing global arms race and in the face of natural resource depletion? UN Coordinator Dr. Bourne says, "In 1967 a number of experts in the United States and at the World Health Organization began to discuss the possibility of eradicating smallpox. Many cynics laughed at the implausibility of the idea and said it was hopeless to consider that one could ever totally eradicate a disease that was as widespread in the world. Now, 13 years later, there has not been one case of smallpox anywhere for the past two years.

The typical American family of four uses approximately 225 gallons of water a day. That's more fresh water than many humans will drink in their lifetime.

"One hundred and fifty years ago, cholera was rampant in Europe and in many parts of America. What revolutionized the health of people in this part of the world was the development of clean water and sanitation systems. Within our lifetime, we can achieve the same advances for the entire world."

G.S.

LAW OF THE SEA

The issue of global law governing our oceans is close to our hearts. We are now well aware of the interconnectedness of world oceans, the fragility of its web of life, and the resources it offers if we manage it wisely. These considerations are essential as we develop the Law of the Sea. It is our hope that nations refrain from cutting the sea into territorial prizes as if it were an immobile frontier. The living resources of the sea are in constant motion and any harm befalling the ocean can damage irreplaceable habitats that affect the whole sea. We have our hopes that the Law of the Sea develops into real global cooperation and local responsibility in management and use of our oceans and their life.

LAW OF THE SEA

'The ocean is greatly more vast than the minds of men.' It reaches from the depth of the earth's mantle to the top of the sky, in constant flux washing the land. The earth is a planet of water and we are beings of water. Water connects all living things. In 1958, representatives of 40 countries came together with common concerns about the use and management of the oceans and their life. It was a big step for international relations, focusing on a part of the earth which has known no borders, no political lines, a global commons. Twenty-two years later, 150 countries are still building the foundation for an international agreement regarding ocean use and management. Since 1958, in a series of international meetings, 93 major issues covering four main areas, territorial seas, high seas, continental shelves, and fisheries and conservation, have identified and woven into a negotiating text. Throughout history, people have been hunters and gatherers in the ocean, exploiting the abundant resources. Today, pressure on the ocean's resources is now causing distortions in our relationship to this life support system. New visions of responsibility built upon new understandings of the fragile nature of the ocean are forcing us to adjust our historical patterns of use. The response is one of concern and cooperation towards maintaining a balance, preserving the historical cultural integrity of our relationship to the ocean while using its resources in ways that nurture its abundance. A final acceptable Law of the Sea is not close at hand because of the complex and integrated nature of the 93 issues being addressed. But the global conversation and spirit of cooperation between nations is growing and brings hope to the spring 1982 conference, taking another step in building a Law of the Sea.

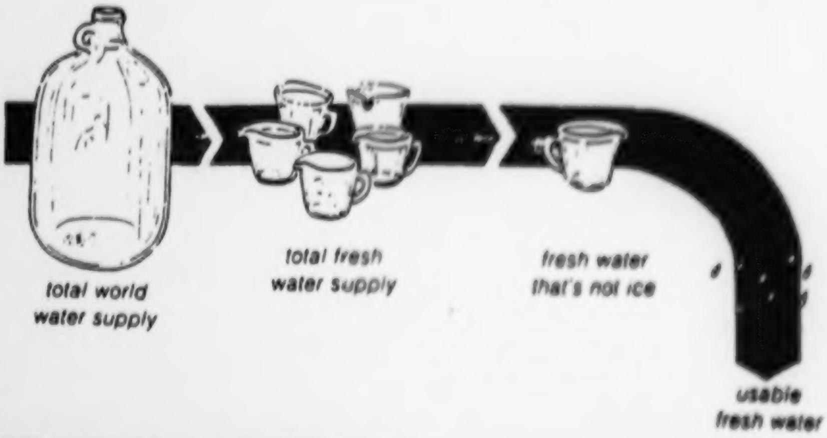
For more information, contact Sea Grant College Program, Oregon State University, Corvallis, Oregon 97331.

ONLY ONE OCEAN

"There is only one body of water on our Planet Earth, constantly traveling from one river to one lake to one ocean. Water frozen today into glaciers and icebergs, and bathing tomorrow tropical shores. Unchanged, perennial, the water of the ocean runs along coastlines of a hundred varied countries, deserts, paradise islands, rocky cliffs, and flat marshes; these hundred nations differ by their people, their degree of development, their religious beliefs, their political regimes, and their administrative structures. The sea is a bonus to all, soothing climates, washing beaches, feeding animals and people, connecting nations together, pregnant with resources of all kinds, but sensitive and vulnerable.

The tragedy lies in the contrast between the indivisibility of the ocean and the selfish way it is handled by each individual country. When the ocean is at stake, the sacrosanct principle of national sovereignty is irrelevant. The way the moving ocean is exploited and polluted is no longer a matter of "internal affairs," since it may severely affect other nations, now and for generations to come."

— Jacques-Yves Cousteau



Island Earth: Lessons in Human Ecology. A series of ten filmstrips created by the Cousteau Society for gr. 5-9 that looks at the earth for what it is — an island in space. The filmstrips look at some of the life processes that occur unnoticed, illustrating concepts of interdependence, energetics, cycles and flows, community diversity, limits to growth, and the economics of nature. Available through Walt Disney Educational Media Co., Customer Service, 500 S. Buena Vista, Burbank, CA 91521.

Conflict in Use of Ocean Resources. A collection of papers edited by Susan Hanna, Kwang H. Im, and Larry O. Rogers of the Oregon State University Sea Grant College Program. Includes perspectives on managing conflicts over ocean resources, and an overview of existing resources in local and world seas. Copies of the report are available from the OSU Sea Grant Program, Corvallis, OR 97331. $5.00.

Northwest Association of Marine Educators (N.A.M.E.) An organization of educators and individuals interested in marine and aquatic education from all levels and all areas of education. NAME sponsors workshops during the year around the Pacific Northwest, along with an annual conference. Membership is $20. For more information, contact Andrea Marrett, Pacific Science Center, Seattle. (206) 625-9333.

Water, Our Most Precious Resource. By Mike Spranger of Oregon State University. Water as a global problem with a focus on Oregon and the Columbia River. Contact Bill Hastie, Oregon Dept. of Education, Salem, OR. (503) 378-5945.

Global 2000 Report to the President. A study commissioned by the President of the United States which projects worldwide conditions for the 21st century in areas of natural resource availability, population, environmental quality and more.

Calypso Log. A publication of the Cousteau Society, published for members of the Society to keep up to date with activities, discoveries, and legislation affecting the oceans. Membership is $15/year. From Cousteau Society, 930 West 21st St., Norfolk, VA 23517.

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Environment and Global Studies

Teaching for the Earth

> **"As we now consider the choices before us, we must realize we are not faced with many separate problems, but with different aspects of a single over-all problem: the survival and prosperity of all men and women and their harmonious development, physical as well as spiritual, in peace with each other and with nature. This is the solution we must seek. It is within our power to find it."**
>
> **Kurt Waldheim**
> **Secretary-General**
> **of the United Nations**

We are constantly told, and somewhere within us we inherently know, that there is but one earth and everything that is a part of it is connected in some way to everything else. But it is difficult to imagine how an eroding hillside threatening a village in India is related to our lives. Separately, this situation seems distant to our lives. When we come to see the larger systems involved, we begin to see connections that will help us understand our interdependence. Connections. That is the key. The more we see and feel our connections to things, to other people, to the earth, the better we feel, the more we understand our place in the world. When we feel at home in the world, then what we do takes on new meaning. Global studies is just that. A path to feeling at home in the world.

We hope that all we are teaching our children reflects this globalness, nurtures in them the growth of awareness and understanding of their connections to the whole world. Until recently, much of our effort to teach globally focused on differences — cultural, political, environmental, institutional differences. We find now that community in the world is not built upon an understanding of difference. It is built upon an understanding of commonness, understanding the things we share. While we still accept and celebrate difference, it is recognizing our commonness that brings us closer together.

In teaching our children now, we have the opportunity, the challenge, the responsibility, to nurture this commonness. Some steps we might keep in mind as we take this path include:

Recognizing our connections with others around the world, and with the earth itself. We become aware of these connections by looking at ourselves more closely. Who grew our bananas and oranges? who fed our cows? who picks our pepper? how do those people live their lives? who gave us our religion, our language, our form of government? who sewed our shirt in Taiwan or harvested our coffee in Brazil?

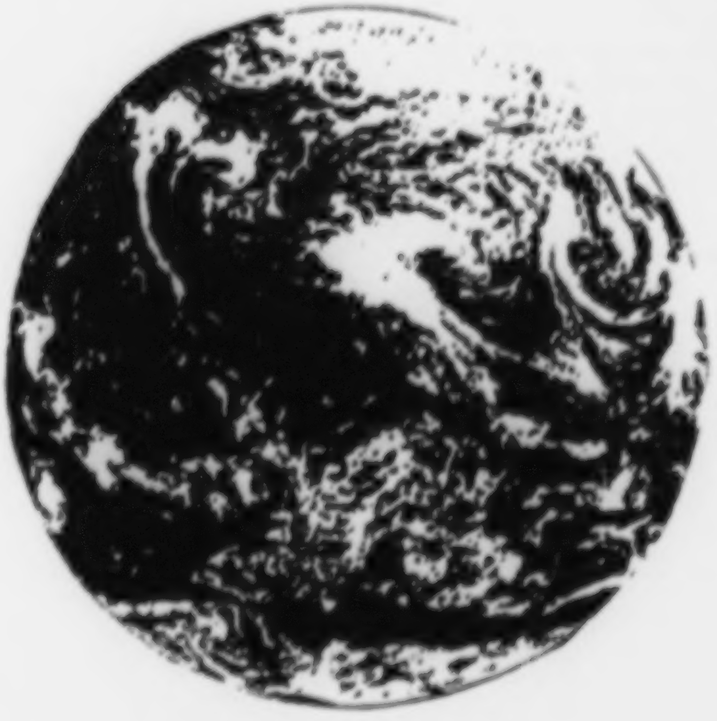
Recognizing the impact of our actions upon the people and environments we are connected to. We become aware of these impacts by looking at the systems that envelope our lives more closely. How does our demand for coffee encourage the deforestation of mountains in Brazil? How does our driving to work alone contribute to oil spills on oceans?

Recognizing that we can change our actions to reduce our impacts on other people and regions. We become aware of these alternatives by working with those around us more closely, by sharing our awareness and concerns with others, and learning as others share their awareness and concern with us.

Recognizing that changing our actions changes our relationship with those closest around us and our close environment. Being aware of our connections with the world goes both ways. Our actions influence others. Others' actions influence us and our local environment. It is essential that we take care of our local communities, our local culture and environment, through our actions.

For all of these things, we need to work at developing greater means of direct link with other people, other cultures, other bioregions. Links that raise our awareness and understanding, that help us develop new means of communicating. Read National Geographic. Learn a new language. Travel. Go live in a foreign country. Invite a foreign student to your classroom. Get a pen pal. It's all there for us, the means for developing a greater sense of our place in the world, a greater understanding of who we are in the world, a greater feeling of being at home.

Michael Soule



SPRING

Rituals for the awakening earth

Spring is morning for the year. Earth is awakening from winter, darkness and dreams, where life has been shifting quietly beneath the ground, like our bodies in our sleep, a kind of dance preparing for the new day. Earth is awakening and we are awakening also. Sap begins flowing. Bulbs push up their violet, yellow and white. Birds bring their songs down from the mountains. Goats and sheep give birth, and whales lead their young north.

Spring is the early time of year, and to touch it wee need to look in the early times of day. Whereas winter is most alive at night, spring is most alive in the early morning and evening.

How each of us explores spring is unique. The signs and sounds that help to wake us, to help us feel our aliveness are different. This aliveness is what the earth is asking us to celebrate in these months, and in so many rituals we respond, by coloring and hiding Easter eggs, dancing round the maypole, or collecting wildflowers.

This morning when I walked outside, the first touch of air told me that the Chinook wind, the sudden west wind of spring, had come in the night. This wind is a kind of voice from the earth that calls me out to winter to come alive.

One rainy morning in March, an hour or so after dawn, put on your favorite wool hat and coat and treat yourself to a long walk. If I had my druthers, I'd leave all my clothes behind, and later return to a hot tub. Hold out your arm in an early spring rain and feel the rain soaking into your skin ever so slightly until it is filled, and then the water runs its course, not unlike the way it cascades across the land when the ground is full. At the very least, your clothes get soaked through to the skin. For it is the rain's purpose to bathe the earth in spring, and us as well.

In April I find myself in a meadow in early morning, always with my journal, pen and hand lens. It is a hunt of sorts, to find those places where the earth bubbles up joy by bringing forth the wildflowers. I know this meadow well. In my memory a kind of map has been gradually created which shows just where the shooting star, the cat's ears, and the monkey flower live. Each spring I once again sit with these friends and draw them in my journal, always surprised at their beauty and detail. I know there will come a year when these wildflowers spring up in me with such clarity that I will be able to draw their tiniest details from memory. This year I am contented to take the time needed to sit and draw them, for it is one of my favorite rituals.

At least once each spring, after the sun has warmed the mornings a bit, I have a special place I visit for sitting. It is a spot I found years ago and is the perfect kind of place for sitting and listening, my own private 'box seat' for the symphony unfolding in Spring. So early one morning before the other sounds of the day have clogged my ears, I sit and let the song of the earth awakening fill me to the brim.

Another ritual that signals the awakening of spring in me is a trip to the ocean with my binoculars, to catch a glimpse of the whales on their journey North. They are the ocean's wildflowers to me, ones that bloom for only an instant and are gone. Always in watching them, I learn great lessons about patience, excitement and anticipation. The whales pass by this way, sometimes it seems, in part to be my teachers.

And so the March rains, an early morning symphony, blossoming wildflowers, migrating whales, become the gifts of spring, gifts that help the year become alive in me, that makes me feel that this year is really new and different, and make me know I am new and different also.

We share these gifts and rituals that you, too, may discover more of the aliveness and beauty of this season around and inside you.

GOING OUTSIDE

Preparing for journeys with children

GOING OUTSIDE

"We're going on a field trip tomorrow," the elementary school teacher tells the students. "To a very special place."

Aside from having a guest come into the classroom to share some fun new activities, taking a field trip is the most exciting part of the school year for most students.

"You mean we really get to go outside and have the schoolyard be our classroom today?"

We have found that the difference between making your field trip just another fun day outside the classroom, and a powerful learning experience in the field, rests with how well we prepare ourselves and our students. Since spring is here and many of us will be going on field trips for 10 minutes to 2 weeks, we've gathered some ideas and resources to help prepare ourselves for our journey.

KNOW YOUR SITE

One fall we took a group of students to their local park to explore the creek as a part of their ecology unit, only to find that the creek which had been rushing in spring, was dry. We could have avoided our misfortune by visiting the park before we went. Things change. The rotting log we are planning to study may be gone, the tree we are going to explore may have blown down in a storm. As you begin planning your field trip, visit the place where you are going and explore it yourself. What you'll find will help you immensely in creating a good experience. If you are going out on your school grounds, take some time to explore them yourself. The students will already have spend many hours out on the school grounds, so the more you can do to search out the little cracks and weeds, the easier it will be to lead the learning activities there. (The list below can help you focus on some things to look for.)

a) Under used or seldom used areas
b) Over used or busy areas
c) Areas where outdoor uses may conflict
c) Areas where outdoor uses may conflict with indoor uses.
e) Sunny areas or shady areas
f) Protected areas
g) Unsafe areas
h) Areas with lots of landscaping
i) Areas with lots of weeds
j) Areas that are neglected
k) Transportation routes (foot or vehicle)
l) Water drainage ways
m) Equipment
n) Hard surfaced areas
o) Textures (walls, hedges, etc.)
p) Shapes
q) Examples of products or careers

CREATING THE JOURNEY

1. **Keep groups small**
2. **Use all your senses**
3. **Manage the noise level**
4. **Plan a variety of hands on activities**
5. **Use tools to aid in discovery**
6. **Vary the movement**
7. **Keep writing to a minimum**

So now that you know your site and have a sense of what is possible to do, it's time to plan the kind of experience you want to create. Remember that what you decide to look at or learn in your activities is not nearly so important as the ways in which the activities involve the students.

1. Keep groups small

With all of the exciting discoveries that crop up everywhere in the field, it is hard to get everybody involved in groups of more than 10. Larger groups also have a negative impact on local flora and fauna.

2. Use all your senses

There is much more to the outdoors than meets the eye. Smell the duff of the forest floor, feel the wet, slimy skin of a slug, listen quietly to the sounds of a meadow at sunset, taste the tartness of a wild blackberry. We long remember things that our senses teach us. Open yourself up to all the sights and sounds, smells, tastes and textures of our planet.

3. Manage the noise level

The outdoors is a very exciting place. It is also one of the few places where people can shout. Sometimes you will want to insist on absolute quiet and listening, but understand that this can be overdone. The outdoors is one cathedral that can tolerate the buzz of excited voices.

4. Plan a variety of hands-on activities

A picture is worth a thousand words and an experience is worth a thousand pictures. The outdoors is a very "hands-on" medium. The opportunities for involving students in action activities are endless. As you plan your day, try and have an itinerary that includes sensory, scientific, artistic, dramatic, explorative, and just plain fun activities.

5. Use tools to aid in discovery

Magnifying lenses, binoculars, nets and other tools are very valuable things to have along in the field. They are hands on things that can be used to focus attention on special discoveries. They are, however, not essential. The American Indian is an example of a top notch nature observer who had the best tools that anyone can have, namely one's eyes, ears, nose, mouth and physical body.

6. Vary the movement

Run, squat, jump, climb, sit, hop like a rabbit, crawl like a slug, walk like a centipede, hide like a deer. All sorts of motor styles are appropriate here.

7. Keep writing to a minimum

Writing and other activities that can just as easily take place in the classroom should be kept to a minimum. Naturalists' notes, yes; reams of data sheets, no!

PREPARE YOURSELF

1. **Learn with student**
2. **Reinforce discovery**
3. **Lead the group on trails**
4. **Use the teachable moment**
5. **Use questioning skills**
6. **Label last**
7. **Ouch! Ouch! Ouch!**

Many of us never go outside with our students because we ourselves are not so keen on nature, we feel like we know so few of the names of plants and animals around us. The first time I took a group outside, half of the 4th graders, knew more plants in the area than I did. But it didn't keep us from having fun and learning new things. The key in guiding outside is that the learning is not so much for the students alone as it is for students and leader together.

1. Learn with students

Don't feel like you need be a 'walking encyclopedia' of facts to lead a good field trip. How you react to something speaks so loudly that often people can't hear what you are saying. Be an enthusiastic facilitator rather than a boring lecturer. Don't be afraid to say, "I don't know but let's find out."

2. Reinforce discovery

When a child brings you a spider, snake, caterpillar or slug, this is the most important thing in the world to him. Respond with enthusiasm to this discovery and call the group together if possible to share what has been found. Hopefully your own discoveries will excite you; share it! *Enthusiasm is a bigger catalyst than knowing a bunch of names.*

3. Lead the group on trails

When you are at the front of the line, you can set the group's pace as well as focus the group's attention. Have one of the adult helpers or responsible students stay with the slowest members of the group. That way you'll know that everyone is somewhere between two places.

4. Use the teachable moment

As you walk down any trail in the outdoors, things are happening. A spider is eating a grasshopper, a hawk is hovering above a meadow, a slug is crawling on the forest floor. Sometimes these discoveries are made at "awkward" times in your presentations. Try and adjust your teaching so that you capaitalize on these special times instead of being annoyed by them. *BE SPONTANEOUS!*

5. Use questioning skills

Discussions involve a group more than lectures. Open ended, stimulating questions encourage thinking. "Why is this animal living here?", "What would you need to live in this place?", "Does this animal have anything special that helps it live here?" These are examples of questions that promote thinking and group interaction.

6. Label last

We are a culture of labelers. Often, once we know the name of something we turn off our attention, put it into its neat little box and search for something else to label. Names are good to know but so is information on what something is, why it does things and other factual items.

7. Ouch! Ouch! Ouch!

Be the voice of the plants when students in their eagerness to get into the woods walk off the trails. Try and impart an ethic without a negative tirade of "Hey, (stupid), watch where you are walking!" Rules put in this way do little to encourage enjoyment and exploration of the great outdoors.

PREPARE THE STUDENTS

1. **Create a mood**
2. **Set some rules**
3. **Dress properly**
4. **Refuel the bodies**

Now that you've got a plan for the outdoor experience, you'll want to get the students involved so that their energy and excitement can be channeled in ways that make the outing productive. We've found that the more the students know about the place they are going and the kinds of activities they will be doing, the less wild excitement you'll have to deal with. The more they are prepared, the easier it will be to connect their experience with their classroom life.

1. Setting the Mood

The flow of the whole day rests in part upon how you set the mood for the excursion, how you help the students feel about their journey beforehand. Help them know the purpose of their journey, so they can see that the outing is really an extension of their classroom learning. We don't go outside to get away from the classroom. We go outside because there are things to learn there that we cannot learn *in* the classroom. Some good activities to help set the mood include telling stories about the site and what we might see there, showing pictures of the site, sharing a map of it, or finding it on a local map. Also, you can develop a kind of scavenger hunt of some things to look for on their journey. These things all help students open their eyes on their journey.

2. Rules

Just as in the classroom, when you go outside there is a need for some kind of order. Remembering that most of the time students spend outside is unordered (they are free to do as they please), it is helpful to create some rules that order their behavior for their adventure. Give them rules only for essential items that tend to disturb the energy of the group and remember that some behavior which is inappropriate inside is perfectly O.K. outside (like shouting and running). Students love to run and shout. If they have to, then try to arrange a way they can do that as part of an activity.

3. Dress properly

Teaching in the outdoors requires a great sensitivity to the effects of weather. Nothing can ruin a field trip faster than a group of cold, wet students. Raingear, hats and gloves are essentials along with adequate footwear in rainy western Oregon. Wind, too, can be a problem. When talking to a group, talk downwind. You body will act as a wind break and it will be easier for them to hear you. Keep your students interested and active and you will have fewer complaints about the weather. Instead of a list of clothing requirements, make a study of exposure and hypothermia part of your preparation. Help your students learn how to take responsibility for their physical well-being by teaching them what their bodies require.

4. Refuel the bodies

Protein snacks such as nuts, sunflower seeds, or gorp go a long way towards sparking a group's energy level (especially when it's a surprise). Remember that before humans can contemplate ecological concepts, their primary needs must be met. Water also is invaluable on a field trip.

A sense of joy should permeate the experience, whether in the form of gaiety or calm attentiveness. Children are naturally drawn to learning if you can keep the spirit of the occasion happy and enthusiastic. Remember that your own enthusiasm is contagious, and that it is perhaps your greatest asset as a teacher.

USE PARENTS AS GUIDES

Parents and teachers together can be an unbeatable combination! The primary key to success is adequate preparation of the parent. If possible, meet with the parents before the trip. Meet with them without any students present, adult to adult, and on first-name basis. If this is not possible, a phone call that allows time to talk is essential. Be sensitive to the following points:

1. You must identify your expectations and convey them to the parents.
2. Parents may need reassurance that they can live up to your expectations. Stress their role as facilitators and fellow students of natural history. Leading a group of students means exploring everything *together*. Excite them with the prospect of being a model *student*, with you. The most effective teaching is modeling.
3. Psychologically prepare them for the possible weather conditions, hectic scheduling and masses of students.
4. Invite them to join you on your first exploration of the nature study site before the day of the field trip. Encourage them to make a journal for themselves.
5. Give them copies of the lesson plans. Go over the field trip plan from start to finish.

RESOURCES FOR THE NEXT STEP

Ten-Minute Field Trips
Helen Ross Russell
This is an excellent teacher's guide focusing on the use of school grounds for environmental studies. School grounds are easily accessible and changes can be observed year round. Book includes related classroom activities and teacher preparations. J. G. Ferguson Pub. Co., Chicago, IL. $6.95.

Eco-Tripping
Cookman, Hyman, Tibbott
This guide is to help teachers become "narrators" of the outdoors, using outdoor study sites located in the Portland area. Activities deal with topics of water, plants, animals, and geology, and can be applied to almost any study site (Anypark, U.S.A.). Guide includes checklist for planning trips and tips on outdoor group management. Available through: EEP, P.O. Box 751, Portland, OR 97207. $5.00.

The School Ground Classroom
EEAO
Here's a curriculum for teaching K-6 outdoor subjects and creating positive learning experiences. Interdisciplinary ideas are included for teachers who prefer to write their own lessons but need some starting ideas, as well as actual lesson plans—some with their own worksheets! Available through: EEAO, P.O. Box 40047, Portland, OR 97240. $3.50.

Sharing Nature With Children

Written by Joseph Bharat Cornell, a nature awareness guide and teacher, Sharing Nature With Children is an easy-to-use book that offers over 40 nature awareness activities based on three basic concepts: 1) nature education should be simple, 2) nature education should involve direct experiences, and 3) nature education should teach values, as well as facts.

Available at $4.95 per copy (plus $1 postage and handling for orders up to $20, $2 for orders over $20) from Ananda Publications, 900 Alleghany Star Rt., Nevada City, CA 95959.

For a while we've been looking for a tool to help us review outdoor school lesson plans, a way to identify major components of our activities and get a sense of their effectiveness. Last week, Rex Etlin from Corvallis Outdoor Schools sent us the outline he uses when planning his program. We hope you will find it as useful.

Review the lesson, then compare it to this hierarchy. Determine how much relative time (best looked at in terms of percentage) is spent at each level of effectiveness (I-V).

The goal is to spend the majority of lesson time in the first level (I) of effectiveness. Other levels are useful when used appropriately; however, they should only be used when necessary.

Obviously we cannot expect 100 percent adherence to this rule. In general, it is better to be at level (I) than (II), and better (II) than (III), etc. Aim for (I) but accept lower levels when (I) can't be achieved for whatever reason.

Minimum acceptance is to have at least half of the lesson time devoted to level (IV) or higher activities (III, II, I). The more time the lesson spends in the higher levels, the more effective it will be as an Outdoor School lesson. Note: There are psychological and educational theories that would back up this hierarchy; however, the reality of seeing lessons happen and observing student response is what I have based this hierarchy on.

A HIERARCHY OF LESSON EFFECTIVENESS

for determining the appropriateness of activities described in lesson plans)

Least Effective ——— Most Effective

I. Physical Interaction
Actual "hands-on" experience, use of senses, doing something with the environment being studied, activity that could only be done there!

II. Physical Interaction and Observation
Hands-on experience accompanied by distant (away from the studied environment) observation; standing back and talking about it, pointing at it.

III. Observation
Standing back and looking at the environment studied, pointing and talking, no physical interaction, discussion while pointing and looking.

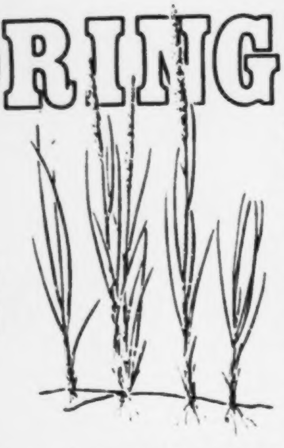
IV. Observation and Discussion
Looking at the study area, then moving away and discussing what's been seen, discussion back in a study group away from the study area.

V. Discussion
No interaction or observation with the study area. Sitting in a group talking about the study area (typical introduction talk), looking at the speaker and not looking at the environment being studied.

Rex Etlin is coordinator of the Outdoor School Program in Corvallis, Oregon. He has been involved in outdoor recreation and education programs over the past few years and has also developed a comprehensive curriculum handbook for outdoor school teachers.

Marine Education:

ANCHORING THE DUNES



by Bill Hastie
Gene Williamson

European beachgrass (Ammophila arenaria)

Anchoring the sand
Network of little cables
Beachgrass holds the dunes

The interaction between sand and grass aptly described in the above haiku can be observed along sandy beaches of the Pacific Northwest. But it is not a "natural" interaction. The grass is an import from Europe, introduced to stabalize sand along our coast at Coos Bay, Oregon in 1910 and later in the Clatsop Plains in 1935. Since that time, European Beachgrass (*Ammophila arenaria*) has significantly changed the face of our beaches.

No feature has so greatly altered the morphology of northwest beaches as the foredune. The present day foredune of the Pacific Northwest has developed in the last forty years primarily as a result of the introduction of European Beachgrass. After introduction, the beachgrass quickly spread, causing the formation of a nearly continuous barrier ridge along our shore.

European beachgrass prefers sites of continuous sand deposition. It grows seaward until it is halted by wave action at the high tide line. Embryo dunes form here at the landward edge of the beach in conjunction with vegetation and driftlog accumulations. Here the velocity of the wind decreases suddenly, depositing the sand load (Figure 2). Continued deposition may lead to the burial of the original obstacle. The driftlogs remain buried forming the base of the foredune, but European beachgrass can survive seasonal sand burial of up to three feet and for that reason is the primary foredune building agent. As sand builds up around the base of the plant, new roots and shoots grow from the stem joints (Figure 3). This traps more windblown sand above, while holding underlying sand within the complicated root network below.

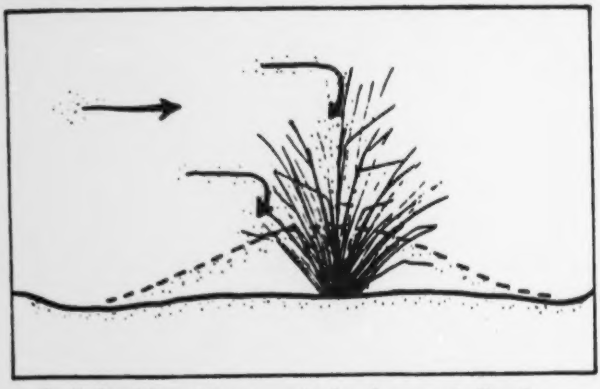


Fig. 2 Sand deposition around a beach grass windbreak

The dune thus increases in height and width until it merges with adjoining dunes to form a barrier ridge along the upper beach. This duneridge area stops and holds most of the sand blowing in from the beach and continues to grow until it reaches the maximum height dictated by local conditions, usually up to twenty-five or thirty feet. It may be bounded on the east by deflation plains, interior dunes, cliffs, marshes, lakes or an estuary.

The foredune is a naturally occurring geomorphic feature which, to some degree, acts as a dike during ocean storms. Its function transcends that of a simple barrier-wall because it has a sponge-like ability to absorb and mute the force of storm waves. Hitting the foredune, wave energy is dissipated over, around and, most critically, into the dune. However, while it can act as an effective shock absorber, the foredune can occasionally sustain considerable damage during storms and may be unable to provide sufficient storm protection to inland sites, thus allowing adjacent deflation plains or hummock dunes to be exposed to the full force of maritime storms.

Foredunes are among the most dynamic of landforms and will naturally fluctuate between periods of being active (subject to wind and wave erosion and breaching) and being conditionally stable (wind stable, but subject to wave erosion and breaching).

The term "foredune" is applied to this ridge wherever it occurs along our coast. However, foredunes vary considerably from 10-30 feet in height to extremely broad and low.

Active foredunes

Sand dunes are in an active state when they possess insufficient vegetative cover to retard wind erosion. In this condition the sand dune is experiencing active accretion and/or erosion.

On a static or accreting beach, an active foredune will commonly evolve towards the conditionally stable state. As the active foredune grows in height (up to thirty feet), it becomes an increasingly effective barrier and progressively less sand is deposited on the lee side of the dune and other sites inland. This offers somewhat greater protection from storm winds, but also seriously limits all fresh beach sand supplies to interior open sand areas.

The active foredune receives such a substantial sand supply that it is occupied almost exclusively by European Beachgrass. Some native dune grasses such as sea lymegrass (*Elymus mollis*) may be found here, but occur less commonly because they are less tolerant of continual sand burial.

Conditionally stable foredunes

When foredunes exhibit sufficient vegetative cover to retard the erosive effects of the wind, they are termed conditionally stable. Obviously, the stability of a given foredune is conditional upon the maintenance of the vegetative cover.

While the conditionally stable foredune may not have any greater resistance to wave erosion than does an active foredune, it appears to recover more quickly from wave overtopping (Ternyik, 1978). However, any conditionally stable sand dune is prone to reactivation upon disturbance of the vegetative cover (called a "blowout").

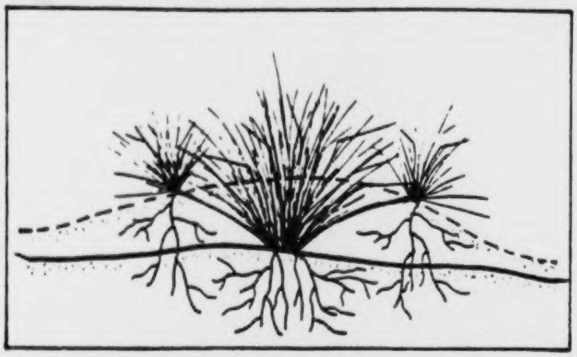


fig. 3 As European beachgrass is buried, new shoot and root growth develops at the dune surface.

. The increasing height of the conditionally stable foredune restricts the inland passage of salt spray and sand. A new environment is thus created on the crest and the lee side of the foredune which is reflected in the vegetation at this site. European beachgrass (*Ammonphila arenaria*), the most significant species which occurs on the foredune, becomes less important because it prefers the more fertile sites of sand deposition. Other species less tolerant of salt spray and sand deposition become established. The first to become established include, among others, such herbs as beachpea (*Lathyrus japonicus*), coast strawberry (*Fragaria chiloensis*) and seashore lupine (*Lupinus littoralis*). Later successional species may include such woody shrubs as salal (*Gaultheria shallon*), or kinnikinnick (*Arctostaphylos uva-ursi*) and an occasional shore pine (*Pinus contorta*).

Other Features of the Beach Area

Deflation Plain: Broad plain which develops immediately inland from the foredune and is wind scoured to the level of the summer water table. In some places, the water table rises in winter to form a shallow lake over all or part of the deflation plain. These are also a result of European Beachgrass introduction and foredune formation.

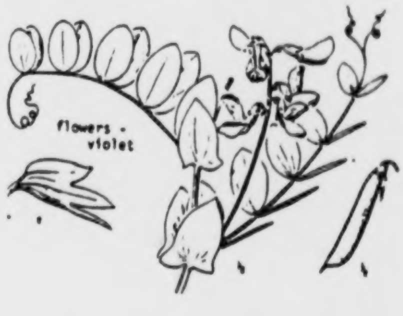
Hummock Dunes: Fields of vegetated sand dune mounds occuring inland from the foredune or deflation plain. These too are largely the result of the mound building activities of European Beachgrass.

Surface Stabilized Dunes: Dunes of any form which possess a weakly developed thin soil and underlying unconsolidated sands. This soil-building process may have taken hundreds or even thousands of years. They will remain stable so long as the weakly developed soil is not seriously disturbed.

Older Stable Dunes: Older dunes of any form which possess both a deep, well-developed soil and moderately cemented underlying sand.

Parallel-ridge Dunes: Multiple sand dune ridges which occur more or less parallel to, and inland from, a foredune.

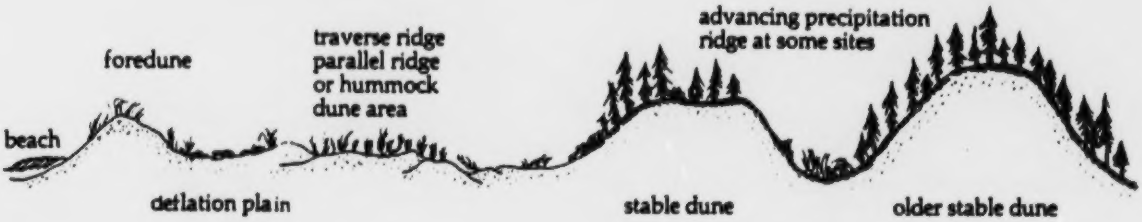
Transverse-ridge Dunes: Low northeast/southwest oriented, nonvegetated sand dune ridges which most commonly migrate in southeasterly direction.



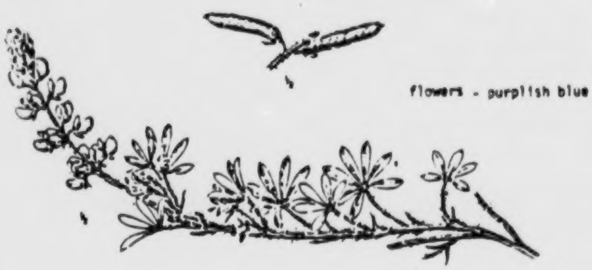
beachpea (Lathyrus japonicus)

Obliquie-ridge Dune (top of which is usually a *precipitation ridge*): Massive, generally easterly trending and migrating, nonvegetated ridge dune.

The interaction between European Beachgrass and sand has created a constantly changing landscape on the Pacific Northwest coast. These changes are easy to observe and study: they provide students with first-hand knowledge and experience in what change is, how it is brought about, and how natural systems can be affected by it.



This brief description is only one aspect of the dynamic nature of our beaches. Much of the material is from: **A System of Classifying and Identifying Oregon's Coastal Beaches and Dunes** by Christianna Stachelrodt Crook; Kathy Bridges Fitzpatrick, Editor, Oregon Coastal Zone Management Association, Inc., 1979.



seashore lupine (Lupinus littoralis)

SOME EXCELLENT REFERENCES ARE LISTED BELOW:
From: Oregon Coastal Zone Management Association, 313 S.W. 2nd St., Newport, OR 97365, Ph (503) 265-8918.

A System of Classifying and Identifying Oregon's Coastal Beaches and Dunes by Christianna Stachelrodt Crook.

An Introduction to Beach and Dune Physical and Biological Processes by Christianna Stachelrodt Crook

Physical Processes and Geologic Hazards on the Oregon Coast by Paul D. Komar

Critical Species and Habitats of Oregon's Coastal Beaches and Dunes by Bill Burley

OTHER EXCELLENT REFERENCES FOR CLASSROOM USE:
Pacific Seashores: A Guide to Intertidal Ecology by Thomas Carefoot, University of Washington Press, Seattle, WA, 1977.

Plants of the Oregon Coastal Dunes by Alfred M. Wiedemann, La Rea J. Dennis and Frank H. Smith, Oregon State University Book Stores, Inc., Corvallis, OR, 1974.

Exploring the Seashore in British Columbia, Washington and Oregon by Gloria Snively, Gordon Soules Book Publishers, Vancouver/London and The Writing Works, Inc., Mercer Island, WA, 1978.

"Oregon Coastal Dunes Between Coos Bay and Sea Lion Point", **The Ore Bin (now Oregon Geology)**, May, 1973, State of Oregon Department of Geology and Mineral Industries, Portland, OR.

CURRICULUM MATERIALS:
Beach Profiles and Transects by Claire Jones, Project ORCA, Andrea Marrett, Manager, Pacific Science Center, Seattle, WA.

SAND ACTIVITIES

Now that we have you tromping around the dunes, let's not overlook the most obvious feature of a dune. This is, of course, the sand. Don't forget to take a baggie or two along to collect samples of sand from:

—the windward side
—the leeward side
—the beach in front of the dune
—an excavation about 2 feet into the dune.

Don't forget to label each sample clearly and remember to set aside a small labeled sample of each for your permanent sand collection. What?! No permanent sand collection? Shame on you. Well now is as good a time as any to start one. Avid sand collectors have literally hundreds of sand samples from all over the world with which to entertain and educate their students. Here's how to start your collection.

1. Never travel without baggies, medicine vials, or film canisters in which to take samples. Label them immediately and permanently. I have dozens of unlabeled samples which are useless.
2. Involve your friends who travel. I have sand from Plymouth Rock, the Egyptian Pyramids, Haiti, and similar exotic corners of the world.
3. Involve students in the search. Some of my best samples have come back from overseas secreted in a dark corner of a suitcase.
4. Join sand exchange groups. Believe it. There are people who regularly mail samples to fellow sand freaks all over the country. NAME is the local facilitator.

"Fingerprinting" Beaches

Materials:
Sands from 5 to 7 beaches of different composition, 100 ml graduate, stereoscope, slides, metric ruler, balance, seive set.

Procedure:
1. Classify each sand sample by colors, density, particle size, composition, and seive analysis.
2. Chart showing the first four characteristics should be constructed by students.
3 .Results of seive analysis should be tabulated on bar graphs.
4. An unknown sample is analyzed and compared to know beaches.

$$\text{Density} = \frac{\text{Mass of sand}}{100\text{ ml}} = \frac{\text{grams}}{\text{milliliters}}$$

Composition by %age of:
shells
quartz—clear or white
feldspar—tan
horneblende—black
garnet—red
olivine—green

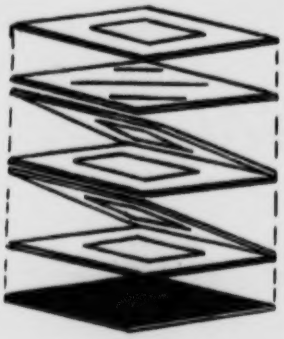
Average particle size—measure directly under stereoscope or microscope (low power)

Storing Sand

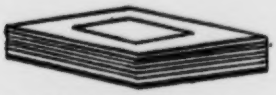
1. Make sure you dry your sample thoroughly.
2. Don't forget labels, inside and outside your container.
3. Allow plenty of room. These collections have a habit of getting into exponential growth patterns.

Displaying Sand

1. Never display, loan or experiment with the last bit of sand from a given sample.
2. Try to display and use sand samples in a way which will not allow them to become mixed. Always dispose of sand samples which have been manipulated, separated, or contaminated.
3. The simplest method is to simply spread a small drop of Elmer's on the end of a glass slide. Sprinkle with a small sample of sand. These are very satisfactory for use with any binocular microscopes.
4. A use for those slidemounts from discarded 35mm slides is suggested by this display technique I picked up from Dr. Barbara Klemm of the University of Hawaii.


Frame
Glass 2 x 2—available from Kodak
Two double slide holders provide the wall for the sand sample
Base—colored paper or glass if you want light to pass through. If glass, use one more slide holder as base.

a. Exploded diagram showing assembly order



b. Assembled Well mount

Seive analysis

Inexpensive and functional seive sets are available from:

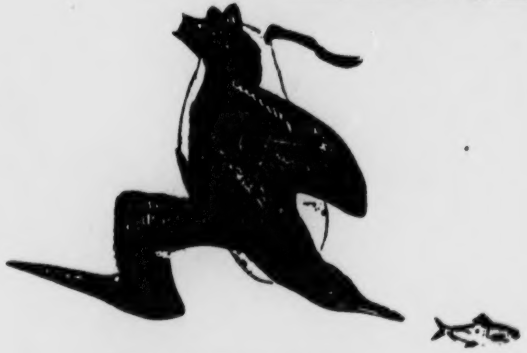
- Frey Scientific Co.
  905 Hickory Lane
  Mansfield, Ohio 44905

Arrange seives with largest screen size on top. Pour in 100 ml of loosely packed sand. Shake *thoroughly* and measure the volume contained in each seive. Make bar graphs to show percentage of sand contained in each seive. This is a distinctive "fingerprint" for a beach.

Finally come up with a few thought-provoking questions:

—What controls composition of sand samples?
—What contols particle size?
—Why do beaches vary so much, even those that are geographically close together?
—What conclusions can you draw about currents and waves based on composition of beach sand?
—In what ways do dune sands differ from beach sands?

drawing by Tony Angell from Marine Birds and Mammals of Puget Sound



THE COMMON MURRE

The Common Murre (*Uria aalge*), along with dovekies, auklets, and puffins, is a member of the Auk family. This is the family of birds which, in the Northern Hemisphere, fills the ecological niche occupied by penguins in the Souther Hemisphere. Like their southern counterparts, Murres have white breasts and black backs. This changes slightly during the winter months, when they develop white cheeks, throat and neck; also a white downcurved line appears behind each eye.

Like many species of penguins, Murres feed on open seas, eating fish and shrimp, returning to land only to breed. Murres nest in the spring on the ledges and cliffs of offshore islands and isolated headlands. Because their breeding space is so limited and precarious, Murre eggs are an exaggerated pear shape. This shape decreases the likelihood of an egg being bumped off of a narrow rock ledge as parents take turns incubating.

Another interesting feature of Murre eggs is that rarely are any two eggs identical (even from the same female). The eggs can be buff, light brown, white, or blue, and can have any combination of spots, blotches, and curved lines. This variation appears to be due to the females eating habits as the shell forms within her body. In other words, the availability and type of food she eats determines the egg's color.

The easiest time to see Common Murres is in the spring and early summer as they raise their young on land. At this time the birds can often be seen in large nesting colonies. Unfortunately, Murres can also be observed washed up on the beach, as they are particularly susceptible to oil spills. Oil hampers their ability to fly and in extreme cases even to swim. There are natural casues for Murre "wash-ups" also. One of them is sudden early summer storms, which wash sub-adult birds who cannot fly off of their rock rookeries. Another natural cause is the sudden decrease in food supply, causing young birds to starve.

When birding for Common Murres, be sure to keep an eye out for Thick-billed Murres. They are slightly larger than Common Murres (which are 16-17" long) and have a white "lip" on the gape of their bills. Common Murres are prevalent all along the Pacific Northwest coast during their breeding season, with Thick-billed Murre numbers increasing as one travels north to British Columbia and Alaska.

L.C.

Summer

I

Summer sits on the doorstep, waiting. One more rain. One more bird flying in from the north. One more butterfly to hatch. And then it is here. We've been growing butterflies in our room this year. Ones we ordered through a biological supply house. They came in a plastic jar packed in tiny styrofoam beads inside a small box. Strange environment for a butterfly to be born into. We set up a terrarium to watch them develop and waited. After a five week journey, they emerged. Actually, two of them died in the cocoon, one has only one wing, and of the last two, one died shortly. The other, we took outside and let loose, lest it die also. It sat in my hand for a minute, feeling the light on its wings, and then it took off, flying straight up to the sun, flying more on the sunlight than on the air. We prayed for it to live at least a short while before being made into some bird's meal. Outwardly, the experiment seemed a failure. We had dreams of healthy butterflies emerging, mating, and leaving us with another generation, of marveling at their beautiful wings, of drawing and painting great pictures of our new friends, and of letting them loose and watching them hover nearby each day. We were left with mixed feelings inside and lessons we had never expected.

Butterflies, like children, have their own way of being, quite beyond our expectations of them. So many aspects to their lives that remain invisible to us. By working with them, getting closer to them, we hope to see more of their joy around them. If it is not more joy that we find, certainly they bring us more wonder. And from our hand the light carries them off.

II

On the lawn yesterday, I found half a robin's egg, empty, like a piece of the sky fallen. Robin's egg blue, a perfect match to the color of the sky in late spring. As if mother robin wraps her child in a coat of the sky for safe keeping, saying "when you can break the shell of the sky, then you can be free". And the unborn, inside, developing and waiting like the children we've been teaching all year. Only a moment more till the last school bell rings, breaks the shell of the school year and out the door they fly. All year developing their wings in the nest of our classroom. Only when summer comes do they really learn how to fly. We've tried to wrap them in the same sky color, blue, and it is the sky that carries them off.

III

The other morning I woke with the sense of something new happening all around. I searched my memory for the feeling but before I could find it, my nose began to twitch, my eyes watered, and my brain started clouding over. Pollen. Those of us with hay fever have an intimate and delicate relationship to trees and flowers and grass. Invisible grains of fertility cast out on the wind. Native Americans consider pollen a special gift from the gods and celebrate the power it holds. Some collect and store it in their prayer sticks to give power to their summer prayer. They understand its power in bringing life to plants, to the earth. In the encyclopedia are pictures of these invisible grains, perfect and beautiful works of art. It says that some flowers have up to ten thousand pollen grains for each stamen. And cherry trees have as many as 200,000 flowers!

Pollen comes this time of year to show us how much our students are like these grains, but students are more than pollen alone, they are pollen, bee, and flower at once, carrying the fruits of their own experiences as fertilizer for the next cycle. And what is inside the pollen grains? There are no pictures, we can only use our imagination. It is as much a mystery as what is inside the children we are casting out into the summer. And it is the wind that carries them off.

Butterflies, robin's eggs, pollen, amid summer's overwhelming green growth and abundance, three things that remind us of what really carries us off across the summer months, what really frees us between school year, and how we really move, just like our children in the sky, on the wind, and in the light.

So when someone asks what we are going to do this summer, we can say breaking our shell, growing wings, soaring, floating, drifting on the breeze, flying to the sun.

Drawing Conclusions from Nature

by Tony Angell
Supervisor
Washington State Office of
Environmental Education

Here are a few thoughts that might give a reader some momentum towards the use of illustration in their learning life and those of their students.

It's no secret that words mask reality. That is to say, we hear one thing when someone means something else. That doesn't happen all the time of course (although it appears more frequently around election time). I would argue that there are many occasions when the creation of a visual image will bring us closer than words can when it comes to understanding the world around us. Drawing is a very direct means by which we make our world more concrete and can thereby organize it more effectively.

> **"Rather paint the flying spirit of the bird than its feathers."**
>
> **—Robert Henri**

There seems to be, along with gesture, facial expression and vocalization an innate capacity to explore design with the infant hand. I well remember the early efforts at this process achieved by our twin daughters using stewed apricots and felt pens on the bathroom door. A major bear mural was underway when I discovered them at work. "Why the door?" I asked. Their answers were not unlike those I might have given. The door was "big enough for a bear" and the right color for a brown pen and apricot composition. Furthermore they were really excited about doing it.

While their excitement exceeded mine they did have a point. A person should use their emotions associated with something seen or felt to rush past any thought of failure or feeling that one's skills are not up to the task. Upon completion one can stand back and view a record of their understanding. This often includes knowledge the artist didn't consciously realize he or she possessed. Suddenly here is something tangible, their own work and one step closer to understanding reality.

For the sake of this brief discussion let me say that I'm using the terms art and illustration in spite of the fact that there are distinctions to be made between the two. In either case however, the creator may give the emphasis that he or she feels is important to their understanding or the message to be conveyed. In pursuit of this "emphasis" I suggest whenever possible that the artist work from reality rather than a facsimile. Photos and drawings done by others already have their "point of view." Try to develop your own. The understanding of the weight, depth and circumstance of the subject illustrated gives life to the depiction. A teacher who allows the student the opportunity to illustrate in this manner can be sure that he or she has not relied on someone else's work or words but has actually observed the subject, touched it and perhaps even held it in the hand. To effectively portray a subject in its environment one must actually be familiar with such places. No amount of photographs will ever substitute for the effect that knowing a place can have on one's work.

Drawing forces selection. The artist seeks the essentials of the object and in the process of depiction discovers much of it. To be successful an illustration must to some degree abstract reality. One seeks to show only the strongest characteristics of the subject. An example might be an artist choosing to focus on those elements of character in the subject that reveal its specialization. A hawk's beak, the heron's legs, the air bladder of floating kelp, the shell of a chiton are all such examples.

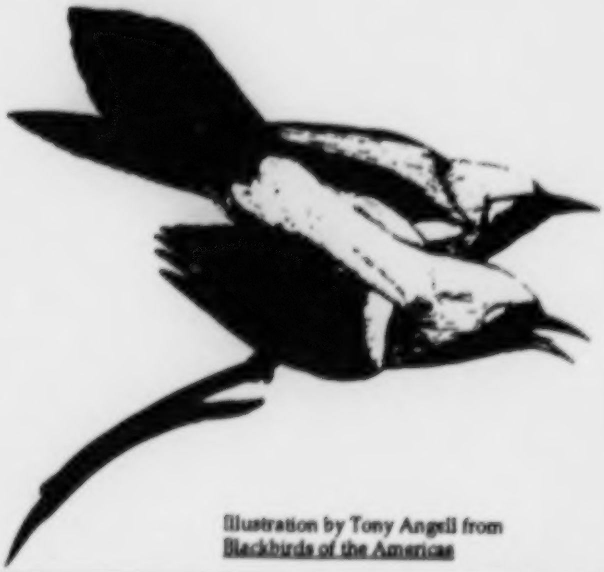


Illustration by Tony Angell from Blackbirds of the Americas

I'm convinced that such drawing can give flow to some very honest and special points of view. Rather than applying prescribed words lifted from text or lecture, the artist takes an angle uniquely his or her own. It reveals a way of seeing life that is instructive to all and the teacher who places these recorded images in an atmosphere relatively free of criticism gives the students a chance to see and sample one another's work. Some self evaluation may occur, but this is not the point. We're more concerned with points of view and originality than with technique.

Drawing provides an avenue wherein the creative side of the student may hold forth. In Marine biology for example, the dynamics of a tide pool with its highly adapted players, can be graphically depicted without the necessity of disrupting the community itself. Interrelationships, adaption and specialization can all be dramatically portrayed in a drawing.

In the hiarchy of pleasures that come from sharing one's work among the most important is the feeling that you have communicated. It doesn't always happen. Still, I've learned that failure to do so may not always be the fault of the artist and indeed the audience has a challenge to study the work and learn the language of the artist. That however, is another story. It is equally important to simply do something original and personal. In an age where so much passivity is encouraged and most people find themselves as part of the audience rather than among the participants, drawing provides an active opportunity to express. It may serve as a means of mastering competence in other skills of communication as well. The information revealed through the process of drawing a subject of interest can prime the learning pumps enough to pursue more information available through reading and interview.

WHAT TO USE:

Never wait to obtain the proper "art" pencil and paper before letting the excitment and spontaniety of the circumstances give birth to a creative drawing. As a matter of fact I find that much of my best recorded impressions are done with the standard #2 pencil on any paper at hand. For me at least it's the moment not the material that counts when it comes to getting the feeling. Design and details can be worked out later.

For finishing a piece of work however, there are some choices to be made. One can transfer the preliminary drawing outline to suitable paper and finish it with a variety of media. For strong contrast and detail ink is my first choice. Scratchboard is the surface I have used for several of my book illustrations and drawings. Here you ink in the major form and then "scratch" in the details and highlights. A warmer medium is charcoal pencil available in several hardnesses. It too can be employed for detail work although a fixative must be applied at intervals to avoid smudging. By the way, even art materials can be hazardous to your health and when applying fixatives be sure to avoid breathing the vapor and work in a well ventilated area.

Pastels, colored pencils and colored charcoal are good for including color in your drawing. Acrylic washes can also be used, but be sure your paper is stretched and taped if you apply any water. Color work might be particularly important when showing displays of animals or insects, designations of life zones or the more ambitious depiction of a landscape and habitat.

A student can spend a lot of money on special equipment and material when a pencil and a pad of paper will do. I think it's best to evolve to various forms of expression from the more direct and personal level. No amount of color or detail will ever substitute for a simple sketch that reveals a subject in an original and interesting posture or circumstance. To reach this point of understanding requires some thoughtful study and reflection combined with ample amounts of excitement generated through discovery. Sounds like learning to me.

> You do not have to be an experienced draftsman or scientist to enjoy drawing and observing nature. All that is needed are time, curiosity, some drawing skills, an ability to look, and a true desire to learn from nature . . .
>
> The tool of drawing can open doors to endless roaming in both city and country, where you can carefully record what you see without having to collect or run home to a field guide book. Wonder, mystery, beauty, and a sense of closeness with the natural world are there when you sit with paper and pencil, drawing a spring crocus, a darting bird, a feeding butterfly, or a small landscape . . .
>
> I find drawing to be the simplest, the most direct, and the least expensive art medium for studying nature. We have so encumbered ourselves today through sports, recreation, and hunting with an abundance of tools for "being in nature" that we have lost the greatest tool of all: simply sitting and watching. Drawing allows for this. We have also lost the ability to learn on our own and to trust our own learning. Nature drawing is a solitary pursuit. The experience is between ourselves and the object. Often it becomes more sketching than drawing, using the pencil more as a tool for taking notes of observations than for creating a lovely drawing. The art of drawing has taught me more about the realms of nature and about the techniques of drawing than has either a biology or an art class. Above all, it has taught me to *see* and to no longer go anywhere without turning over a leaf or a rock or pausing to watch a bird preening and asking myself, "How would I draw that?" As a teacher I find students continually wanting to know how to draw nature. The best teacher is nature itself. I can offer suggestions, exercises, and moral support. But the best suggestion I can give is to go out and begin *looking*.
>
> Use the opportunity to learn about nature as well as drawing. Study both equally, but do not expect to become a great artist or naturalist overnight. Both skills take time to acquire. Again and again I find that the most valuable product of my study has been not the image on a piece of paper, but the experience of being so directly involved with nature. . . Use [drawing] as a *tool* to help bring yourself closer to a world that at one moment is eternal and at another, extremely fragile.
>
> from *Nature Drawing*
> by Claire Walker Leslie
> Prentice Hall, Inc. 1980

Resources

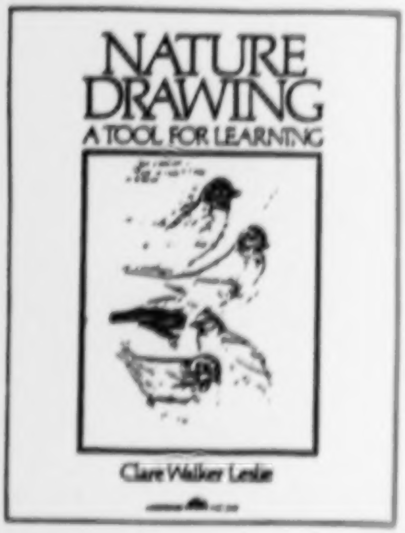
NATURE DRAWING: A Tool For Learning

by Claire Walker Leslie
Prentice-Hall Books, Inc.
1980

Although Claire Walker Leslie has written a book on drawing, and has filled it with a wonderful array of sketches, drawings, and studies from a number of sources, the important message is not about drawing. It is about seeing.

By taking pencil or pen in hand and going out to draw in the natural world, we are also engaging in an exercise in observation, and a lesson in natural history. *Nature Drawing* leads us toward acquainting ourselves with the wonder, mystery, and beauty of life by making us *look*, which allows us to *see*.

This is an approach uncommon in art books. For some, an emphasis on style, or technique, is important. But in *Nature Drawing*, it is the process, not the outcome, that really matters.



This approach, however, does not overshadow the inspiration and encouragement received throughout the book. It is arranged in chapters dealing with materials, techniques, and methods, followed by subjects in the natural world: plants, animals, birds, and finishes with a chapter on keeping a naturalist sketchbook. Each chapter contains exercises which encourage openness to the process of drawing, allowing freedom of personal expression, yet emphasizing the underlying purpose of her book: to get the drawer to become a student of nature.

Nature Drawing shows us how drawing can help us enrich our outdoor experiences and help heighten our awareness of things we often take for granted. Naturalists can use this book as a means of improving their observational skills, and to learn more about the natural world. The text is simple, emphasizing the need to understand the natural history and biology of your subject, which results in the book itself being a mini-course in natural history. Illustrating her chapters are illustrations from the author, her students, and such well-known artist/naturalists as Ernest Thompson Seton and John James Audubon.

Nature Drawing is a textbook for drawing, from beginning art student to the professional who might need to refresh his or her approach to the craft. It is as appropriate on an elementary school bookshelf as in an art school. And its message, of awareness and appreciation for the natural world, is a real treasure.

THE ZEN OF SEEING: SEEING/DRAWING AS MEDITATION

By Frederick Franck
Random House
1978

Frederick Franck approaches art as an extension of being. That by sitting still and just watching, everything and everybody becomes a work of art. The *Zen of Seeing*, then, is a work not only about drawing and seeing, but also a reflection on the Zen-quality of seeing a diving quality in everything.

Franck is able to access this outlook through his art. His drawings reflect his appreciation and celebration of life, from elderly people to the simplest blade of grass. His book is not a how-to-draw methods book. It is more an account of how to approach life, which then leads to its expression through drawing.

The book is hand written, intended to show the love Franck feels toward the subject. His drawings are sketchy and ethereal, which de-emphasizes the outcome and emphasizes the all-important process. As Franck says, "In this twentieth century, to stop rushing around, to sit quietly on the grass, to switch off the world and come back to the earth, to allow the eye to see a willow, a bush, a cloud, a leaf, is an unforgettable experience."

To Franck, drawing is a form of communion with nature, a meditation that enables him to become one with the tree, or cloud, that he is drawing. It is that relationship between artist and subject that unleashes the magical quality in drawing.

DRAWING ON THE RIGHT SIDE OF THE BRAIN

By Betty Edwards
Holt-Rinehart, Inc. 1978

Recent discoveries point to the existence of a split brain, which says that the left and right sides of our brain control different aspects of our nature. The left side, which controls the motor functions of the right side of the body, also controls the logical, analytical and numerical modes of thought. The right side, on the other hand, controls the intuitive, spatial, non-verbal, and wholistic modes of thinking.

In *Drawing on the Right Side of the Brain*, author Betty Edwards gives us exercises that we can do to open up and gain access to the right side of the brain. As an example of the process, she has printed drawings done by students before and after her classes. The improvement in accuracy, confidence, and visualization is remarkable.

As with all these books on drawing and seeing, the message is clear: if we want to draw, we have to be able to see, and if we want to see, we need to really *look*. By accessing the right side of the brain, we are overcoming the major stumbling blocks to our inherent creative nature, and utilizing the part of the brain that controls the creative process.

These three books are all saying the same thing: that we need to access certain parts of ourselves if we are to open to the creative process in drawing — but they are addressing the issue from the unique perspective of those parts: the eye (*Nature Drawing*), the brain (*Drawing on the Right Side . . .*) and the heart (*Zen of Seeing.*) Our conclusion should be that it takes all three.

ACTIVITY

Here is an activity that will introduce your students to the concept of adaptation through an exploration of how birds have developed different shapes and sizes of beaks to adapt to specific feeding requirements.

Black Scoter

BILLS & BEAKS ADAPTATION GAME

CONCEPT: Adaptation
OBJECTIVE: The student understands that the shape and size of a bird's bill/beak is suited to the kinds of food available to it.
AGES: 3rd grade to adults
NO. OF PARTICIPANTS: 15-60
PLACE NEEDED: Any area large enough to form a comfortable circle in.
EQUIPMENT NEEDED:

BILLS: spoons
clothes pins
tweezers
tongue depressers (sets of 2)
scissors
FOOD: marbles
colored toothpicks
washers
RECORDER: pencil
paper
timer

—Have the group sit down in a circle.

—Begin with a brief explanation of the word "adaptation" (if you haven't already discussed it), as it relates to a bird or animal's food source, and its means of getting that food (hawks—talons, hummingbird—tubular shaped flowers, etc.).

—Introduce each of the "characters" in the game to the circle, by telling about an imaginary or real bird, with a name who uses the "bill" that you are showing them ("spoon-billed ibis"—spoon, "Cross-billed bird—scissors, etc.).

—Pass out the "bills" to the children, varying the kinds of bills around the circle. (Note: don't let them choose which one they want, or you'll never get around the circle.) Tell the students that they can only use *one* hand to manipulate their "bill," but they can put the captured "prey" into their other hand for safe-keeping as they play. (Remind them throughout the game to only use one hand.)

—After they are all well acquainted with "who" they are, and how to use their "bills," it's time to pass out the food.

—Again, use your story-telling talents and create a name for, and a tale about the "food" or "prey" that your birds will eat. Use *one* "food" each time you play—for instance, tell about a wonderful, lush green land that is full of a special kind of round creature, who crawls very slowly, is brightly colored and shiny—the Marble Snails!!!

—Place all of your snails spread out on the ground in the middle of the circle, equidistant from the perimeter of the circle.

—If the children playing are mixed ages, with much younger ones included, it helps to "handicap" the older kids (tie one hand behind their backs, or have them kneel). Otherwise, have all of the players kneel (and stay on their knees throughout the game).

—Tell the children that what they need to do is to gather as much food as possible within a set time (45 sec. works well—depending upon the amount of food available). Upon hearing your signal, the "birds" descent upon their "prey." When it's time, give your signal to stop.

—Have everyone stop right where they are, and set a place for each kind of "bird" to gather (ie, the spoon-bills under the tree).

—Each group of "birds" then pool all of their food together, and obtain an *average* amount of food caught per participant in the group. (A good math lesson—they will need help with this part.)

—Have the group re-form in the circle. The leader of the game then records each average, and reads the results back to the players, using alot of enthusiasm and drama, starting with the lowest amount caught (or those less well adapted) to the highest amount caught (or the most well adapted group). Discuss which kinds would in the end survive, and what changes the other birds need to make to adapt to their environment, and to survive ("survival of the fittest").

—With the children keeping the same "bills" distribute another "food" in the center of the circle, telling of an abrupt climatic change that killed all the "marble snails" and created a new habitat that is perfect for the new food. Play the game again with the same time and rules—computing the average, reading the scores, and drawing comparisons with the first game. If the enthusiasm is still high, play again with the third food.

—End the game with a quiet circle discussing adaptations—who would have survived if their game had been real, why, who would they like to be, how would they survive if the climate changed, in the North Pole, in the Tropics, etc.

—this game was "adapted" from an Audubon game.

Rough-Legged Hawk

Connections and the Magic of the Elk

The Indians call them Wapiti. We call them Elk. In this area, they are Roosevelt, or Olympic Elk. The natural history books say that winter is the best time for "viewing" the Elk, as large numbers of them migrate down out of the hills in the cool, wet weather to spend the day grazing in the meadows.

As a new migrant from the south, given the opportunity to do a drawing for the Clearing cover, I started searching for the most appropriate plant or creature to represent this season. Through the library and bookstore shelves I was drawn again and again to looking for something about the Elk. The "Elk Crossing" signs on the highway to the ocean warned me of their presence, but during a quick search I found very little written locally about them. But the image seemed very clearly to be the one to draw, and 3 days later a face looked back at me from my pad of beauty, strength, power and wildness. WAPITI — The Elk. By the time I have completed a drawing I have looked so closely at the creature who I have drawn, that there is a deep connection betweenus, and it was so with the elk.

The Elk followed me around in my mind all evening. The next morning, after much indecision, I started walking along a logging road leading out from my new home. What happened is what always does happen for me — the wonder and magic of the earth took over and focused all of my energies into the excitement of exploring and learning the new plants and animals of the area. I was surrounded by ferns, mosses, and aged stumps of virgin forests as I marveled over all of the wonderful mushrooms showing themselves to me. As I was looking closely at an incredible golden fungus I heard a crunching in front of me in the underbrush. I slowly looked up and saw an enormous creature walking along with it's head lowered, grazing. All that it showed me was a horse-like body, with a very different rump of yellowish hair. Finally a movement by me brought it's head quickly erect, and I was fixed in the direct gaze of a female Elk-Wapiti. As she stood tensely watching me, she was huge, powerful and incredibly beautiful. We looked into each other for what seemed like a long time. I could feel her strength in me, yet felt the need to assuage her obvious fear of me, the human animal. While looking at her, I smiled to myself to see that she even had a dark spot on her chin like my Elk friend in the drawing. The sound of more sticks breaking in the underbrush told me that she had a companion with her, but loud warning calls from some little forest mammal told the Elk of danger, and my friend abruptly broke our connection and ran away in fright.

I was overwhelmed with excitement and deeply moved. I felt privileged to have been allowed to see her — a very strong sense of welcome to the Oregon woods rested with me and a deep connection with this Elk creature. As I continued down the road, one of the Elk made a loud sound somewhat like a bark, over and over again, that resounded through the trees. My enormous smile reflected the excitement and awe that I always feel after those rare privileged moments of a direct connection with something wild.

Throughout the evening I remembered the doe Elk. In the night I was awakened from restless dreams by what seemed to be "explosions" that rattled my windows and actually shook my little house on poles in the trees. The sound came over and over again and continued throughout the night and late into the morning. I was finally driven into town to be away from the sound, and the uneasy feeling that it gave me. When I asked one of the town folk what it might be, I was told that it was probably hunters. "You know, it's Elk season out there." My uneasiness turned to sickness and hurt. I thought of my connection with the Elk in the drawing, and of the strength I felt from the doe Elk in the woods. I remembered seeing a head of an elk earlier in the week that had been severed from it's body, and rudely displayed on the front of a pickup truck. The images fit together only too well, and I was reminded again of the direct connections of things in Nature. The Elk lives in the forest where it is a crucial part of a whole chain or cycle of events. As a primary consumer in a food chain, the Elk feeds upon certain plants. It's manure returns back to the forest floor certain nutrients, and when it dies, it's body decomposes to complete the food chain — the circle. It is a complete cycle.

Humans always have a direct impact on the earth, and each of us, of course, are a part of a cycle also, whether it be a part of a food chain, or an energy or spiritual circle.

The magic of the Elk-Wapiti is still very strong for me, and as powerful as her gaze. For me the experience reinforced my commitment to teach children (and adults) about the earth — and just how special a place it is. To allow a child to learn to look closely enough at something so that it feels like it's "inside" that thing, as I felt from my drawing with the Elk, is to enable that child to be able to fully comprehend, or feel, her place in the cycle or circle of the earth. The understanding of the connections between all of us in Nature is part of what the magic of Wapiti is, and is the basis for all of us to learn to be the earth's caretakers.

(Good places to "view" Elk this winter are the Jewell Meadows, Beneke, Wanaha, and Hunting Wildlife areas.)

Teaching For The Whole Earth

perspectives on living and learning in harmony with the earth

A group of five wise men, all blind, came upon a large object in the middle of the road upon which they were travelling. Each happened to choose a different area of the object to determine its identity.

"It is a snake," said one. "I am afraid."

"No, no," said another, "it is a large bird, for I can feel its wings."

The third man, examining what he thought were the trunks of large trees, said, "We are walking into a great forest. I propose we go back."

The fourth man, feeling only a large, flat, solid object, decided that it was the wall of a building which they had encountered.

"You are all wrong," said the fifth man, "for it is but a large coil of rope, and I am holding the end of the rope."

At this point, all five men began to argue that they were right, each having determined that he was correct from what he had discovered.

Whereupon a small boy, able to see that it was merely an elephant, came up to the animal, climbed upon it, and rode away.

based on a Sufi story

This story expresses the same fallacy we have held in regard to our relationship with the earth and our knowing about the natural world. Throughout history, society has only been able to see the earth and all life upon it as a random collection of independent parts, and man as separate from those parts. Our view, until recent years, has been limited in scale to what was within our immediate sight and in scope to a man-oriented perspective. That restricted vision has been a root cause of many of the environmental problems we have faced in recent times: an inability to see the earth as a whole place, where our actions in one part can have a long range and profound effect on another part, and in the belief that man is somehow separated from his environment.

In 1967, after orbiting satellites sent back the first pictures of the earth, our perspective began to change. For the first time we could see our planet as a whole; as a single, life-filled globe in the vastness of space. When Adlai Stevenson remarked that "we are all passengers on Spaceship Earth," it marked the turning point in our perspective of ourselves and the earth. Since that time we have seen countless pictures of the earth from space, each one reminding us of our new vision of the earth as a whole system.

In recent years, Dr. James Lovelock, a British scientist, has taken this vision of the whole earth and hypothesized that the earth and all life upon it is essentially a single, large, self-regulating organism. The Gaia Hypothesis, named for the earth mother goddess of Greek mythology, says that the organism as a whole is affected by what happens to its individual parts.

Making The Connection

Environmental Education has tried to integrate this vision of whole systems into an understanding of how the earth works and our place within that system. New values are emerging, and from those values comes an environmental ethic to guide our actions in caring for the earth.

This looking at whole systems has been extended to our relationship with one another as well, evolving a global perspective of all humans on earth as members of a human community and as members of the natural community, or Gaia.

A major role of the classroom is to guide our children through these new ideas, and help them develop an appropriate ethic based on the values implied in our new vision of the earth as a whole being.

Can We See Our Seeing?

We want to look at this new vision of wholeness as a grounding belief; an all-encomapssing way of looking at, being with, and teaching for, the earth. It is a starting point for teaching about the environment.

It means understanding that we are one with the earth. As an organism living upon the earth, we are as much a part of our environment as our environment is a part of us. To separate the two is impossible, and we need to be responsible, in the way we live our lives, for the health of that relationship.

". . . the organism-environment dichotomy is nonsense; all living things are open systems, constantly exchanging atoms with other systems, living and non-living—there are no impermeable boundaries. Don't be mislead by that thick skin of yours; when you cease to exchange, eat, excrete, breathe, you're dead.

The organism-environment comparison is fundamentally meaningless. The atoms are transient; what is environment today is organism tomorrow, what is organism tomorrow is environment the next.

We should be careful what we dump into the environment, because, physically, and psychologically, tomorrow it's likely to be us."

—Daniel G. Koslovsky
An Ecological and Evolutionary Ethic

When we begin to think in terms of the whole earth, it changes us. It changes us from exploiters of the earth to its stewards, because we recognize that the health and well-being of natural systems, the whole system, is synonymous with our individual and collective health and well-being.

When we consider ourselves as separate from our environment, we find it somehow easier to disregard the consequences of our actions. But if we see the connection—see how we are not separate from our environment—we begin to treat the earth with reverence and respect.

The ancients believed that the earth was a living being that felt the action of people upon it. I submit that since we have no scientific evidence to the contrary, we accept this view and behave accordingly.

—St. Barbe Baker

How Do We Explore It?

Everyone will have their own way of seeing the whole picture. It is manifested in many different ways. Some perspectives we have found helpful in understanding are found in *Gaia*, by Dr. James Lovelock, *Permaculture*, by Bill Molison, *Mind of Our Mother*, by Bob Samples, and *Earth Wisdom*, by Dolores LaChappelle. Each of these is an expression of the author's individual vision of wholeness. In all of them, that vision is expressed in their feelings of oneness with the earth.

We have included, the the following pages of *Clearing*, a selection of articles that look at three aspects of developing a whole perspective about the earth:

1. **Our relationship with the whole earth. Developing an environmental ethic based on a wholistic relationship with the earth.**
2. **Our approach to a whole teaching methodology. Approaching teaching methods that address or are condusive to the development of a wholistic attitude towards the earth.**
3. **Developing a global perspective through our school curriculum.**

The first article in this section addresses the creation of a new environmental ethic as a first step towards a relationship with the whole earth and the development of a personal sense of responsibility toward the continuing health and well-being of the natural world.

The second two articles briefly address the role of teachers in creating an atmosphere and learning environment condusive to the development of an environmental ethic. Dolores LaChappelle, in *Earth Wisdom*, speaks to the need for whole-body, experiential activities that utilize all aspects of the learning process to create a real understanding. Activities should be grounded in the earth, so that children at an early age connect to the earth as the source of all true knowledge. The second article, excerpted from *The Wholeschool Book*, states that the teacher needs to be transformed before the children can be taught these lessons. Our own understanding is reflected in how we teach.

The third article is a synopsis of a much larger piece by Robert G. Hanvey entitled *An Attainable Global Perspective*, which is a discussion of where lesson plans should be moving in terms of attaining global perspectives.

Following these articles is a selection of readings that can help you gain a deeper understanding of whole systems and how your teaching can reflect these ideas.

DEVELOPING AN ENVIRONMENTAL ETHIC

New Directions in Environmental Education

by W.A. Andrews

Abstract

Some environmental education courses study the principles of ecology. Other courses investigatge environmental issues. Still others blend ecology and issues. Few courses, however, make a deliberate effort to develop in the students an environmental ethic that can constitute the moral base upon which the students will make environmental decisions today and tomorrow.

This paper presents an appropriate environmental ethic along with a rationale and a scheme for its development in secondary schools. Without such an ethic, citizens will forever face new environmental issues. With such an ethic, many environmental issues may never arise.

An Appropriate Environmental Ethic

An environmental education course achieves little if it fails to develop in students a personal environmental ethic that results in positive values and attitudes related to environmental, economic, and social issues. However, the teacher must be careful not to indoctrinate students with his/her personal set of values and attitudes. The teacher's role is to provide students with a balanced set of experiences that will help the students form positive values and attitudes.

To be able to select, organize, and offer experiences to students that will help them develop their personal environmental ethics, the teacher must possess a clear idea of what constitutes a reasoned, defensible, and appropriate environmental ethic for today's and tomorrow's world. The following discussion should help the teacher form some basic ideas on this matter.

Our Current Environmental Ethic

Somewhere along the human evolutionary path, certain subcultures incorporated into their moral base the concept that humans stand apart from nature, that humans are superior, having dominion over all forms of life, and that nature exists only to serve human needs and wants. With the advent of the Industrial Revolution, those subcultures, now known as western civilizations, became convinced that continuous progress and material gain were necessary to achieve the "good life." History shows that these two principles—*dominance* and *continuous progress*—are largely responsible for our relationship with the rest of nature. Thus these two ideas constitue our current environmental ethic. This ethic governs our behavior toward both living and non-living components of the earth's ecosystem or biosphere.

Though the principles of dominance and continuous progress gave western civilizations many advantages over other civilizations, it is becoming increasingly obvious that the advantages may be short-lived. In fact, most ecologists agree that the ethic of dominance and continuous progress must be abandoned if the natural environment and ultimately the human race are to survive. Regrettably, our society has been committed to the ethic of domininance and continuous progress for so long that the ethic has formed the basis of many of our traditions. Traditions have considerable impact on the formation of values in a society, and those values determine the behavior of individuals and groups in the society. Thus it is very difficult to abandon an established ethic with its accompanying traditions and values. Further, when the ethic of dominance and continuous progress directs our lives, we often confuse needs and wants. For example, a person may say that he/she *needs* a larger house because the family does not have enough room when, in fact, the person just *wants* a larger house to accomodate a games room, a television-viewing room or some other luxury that is not a true need. Unfortunately, the satisfying of such wants, on a societal scale, places extra demands on an already overstressed natural environment.

The main task of an environmental education course is to help produce a generation of people less committed to the ethic of dominance and continuous progress than is the present generation. Students can be made aware of the dangers inherent in this ethic by studying problems created by it. However, all people need an ethic on which they can base their decisions. Thus you cannot get rid of the ethic of dominance and continuous progress without providing a replacement. What should that replacement be?

A Transitional Ethic

One possibility for an ethic is based on an understanding and an acceptance of the ecosystem. This ethic recognizes that humans are an integral part of nature and that survival of the human species depends on the survival of other species. This ethic relies on self-interest, self-survival, and species survival to motivate humans to look after the rest of nature. In other words, it is based on the familiar premise that what is good for nature is good for humans. This may be the workable ethic to pursue. Regrettably, though, it contains the same element of selfishness that contributed to many of our problems and uses that selfishness to get us out of the problems—a sad, but possibly necessary, fact.

This ethic, based on the ecosystem concept, is referred to as a transitional ethic since it will only lesson human impact on the environment until a more morally proper ethic prevails.

A New Ethic

The long-term goal of the environmental education program in a school system should be to inculcate in students an environmental ethic that is based on the following principles:

- Humans should respect all other living things for what they are, not for what they can do for humans.
- Humans should respect the lives of all living things and kill other organisms only for food and other

basic necessities for survival.

- Nature is beautiful, and that beauty should be preserved for this and subsequent generations to enjoy.

Obviously, these principles are more abstract and less clearly defined than the principle of species survival that governs the transitional ethic. As a result, an environmental ethic based on these principles initially may be less workable. However, in the long run it is morally more proper, for if we acknowledge our respect for the lives of other living things, we have a moral obligation to utilize the environment in a way that does not threaten the lives of other organisms or endanger any species of organisms.

Many people will object to this ethic because it takes humans off the pedestal and places them on a par with other species. As a result, we could no longer look at the environment as a means of satisfying human wants, nor could we continue to neglect our moral responsibilities for other living things. This ethic puts under question such traditional pursuits as sports hunting, the wanton logging of large tracts of forest, and the use of waterways for sewage disposal. Should such pursuits be questioned? What environmental problems could be solved and prevented if our society adopted an environmental ethic based on a respect for all living things and an acknowledgement of the intrinsic beauty of nature?

A Master Plan for the Development and Application of the New Ethic

The most appropriate and effective way to develop an environmental ethic in students is to incorporate materials relating to the ethic in all aspects of the students' learning in all years of their formal schooling. Including one or more courses in environmental studies at the secondary level makes possible an in-depth exploration of the ethic and its implications. Whether exposure to environmental education is lifelong or limited to one course, a pattern exists for the logical development and application of the environmental ethic. This pattern is summarized in Figure 1. Without deliberate adherence to such a pattern, students may end their formal schooling knowing some ecology and, perhaps, understanding some environmental issues, yet they may be unaware of the root causes of environmental problems. The intent of this pattern is to develop a generation with an environmental ethic that will let them see these root causes and help them judge, at an ethical level, which actions are right and wrong in environmental matters.

As Figure 1 shows, the pattern begins with the teaching of the ecosystem concept, which, simply stated, says that all the components of an ecosystem, living and non-living, are interdependent (Step A). This concept is then shown to be universal through its application to a variety of ecosystem types (Step B). The knowledge of the universality of the ecosystem concept is now used to guide students in the formulation of the transitional environmental ethic; that is, an ethic that recognizes that the well-being and survival of the human species depends upon the well-being and survival of other species (Step C). However, if Step B is initiated while the children are very young, it is possible that the new ethic may be inculcated in the students at Step C through continued and intimate contact with a wide variety of living things in their natural habitats. Finally, students must use their environmental ethics to investigate a number of environmental issues (Step D). Students can study how the ethic of dominance and progress leads to problems such as soil erosion, domestic wastes, and air pollution. Then they can explore how either the transitional ethic or new ethic, employed at a societal level, could lessen such problems and, in many instances, prevent their occurance.

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Step A

Establish the Ecosystem Concept

Introductory unit on ecology
Classroom-oriented content and activities

Step B

Develop and Apply the Ecosystem Concept Through Study of:

Freshwater ecosystems
Terrestrial ecosystems
Soil ecosystems
Marine ecosystems

Step C

Formulate an Environmental Ethic

Based on the ecosystem concept
Function: to guide decision-making

Step D

Use the Environmental Ethic in the Exploration of Environmental Issues

Soil erosion
Solid waste
Domestic waste
Pesticide use
Air quality
Energy conservation
Water quality
Agriculture
Wildlife management
Noise pollution

Figure 1

Developing and Using the New Enviornmental Ethic

Whole Body — Whole Mind Education

by Dolores LaChapelle

In education, there's an ever-recurring cry of "Let's get back to basics." I'm for that—but by basics I mean real basics, not just the limited, half-brained learning which concentrates on reading and writing, thus making our children right-hemisphere non-literates, a sign of a far more serious deficiency than that defined by the ususal word, illiterate, which refers to the left hemisphere . . .

In Chapter 12 (of *Earth Wisdom*), I went into the importance of nature in educating young children. I don't mean the ordinary types of nature study, which do not involve the whole person. Fortunately, there is one book which provides explicit help, so that anyone can begin real nature education. This is Steve Van Matre's book, *Acclimatization: A Sensory and Conceptual Approach to Ecological Involvement*. In the beginning of the book, he writes, "We learned that a sense of the inter-relatedness of life, a respect for the wholeness of the environment, cannot be conveyed piecemeal by the dissection of its parts." Nor are we helped by prophetic statements of the doom which will follow if we don't respect the environment: "All the pollution statistics ever conjured up will not stir the soul of one energetic lad."

His solution is, "Let's help our students acclimate themselves to their own environment. To understand it on their own terms, and its own merits . . . Let's subject the camper to the most sensory experience imaginable: mud baths, bog crawls . . . the camper should come to 'feel' his environment. To draw it close to him. To love it. To understand it—not for its labels and fables and fears—but as an intrinsic part of himself. . . . The rewards: seeing the science of ecology lifted from the realms of the momentary fad; removed from the world of the textbook; to become a meaningful, natural, commitment in the lives of young people." The goal of the acclimatization program is "a breaking down of the barriers to the point where one human being can feel himself not only completely surrounded by the environment, but totally involved with it as well. Once he has felt this unity with Nature, he is more hesitant to destroy her; he realizes that to do so would be to destroy himself." The reason I single this book out for special mention here is that Van Matre has adopted several techniques from the human growth movement and encounter groups and has used them not only to facilitate interaction between the people involved, but, even more unusual, to facilitate interaction between the human beings and the non-human beings around them—animals, plants, and the environment itself as a living being.

Essentially, what we are concerned with here is education for total awareness. Such an education encomapsses all of life, not just that particular segment of it which is spent in school. Thus parents play a large part in educating their children. The most important advice I can give here is based on John David Garcia's premise in his book, *The Moral Society*: "A decent person is immoral when he is deliberately willing to sacrifice anyone's awareness, including his own for anyone's happiness, including his own." Sacrificing awareness for happiness in the long run insures unhappiness, because such a method interposes a buffer between the individual and the reality of that individual as an organism-in-the-world. The following variation of Garcia's maxim provides a guideline for parents: I will not sacrifice my child's awareness for his or her happiness. Or even more to the point, as far as the parent-child relationship goes: I will not put my happiness above our awareness. This, of course, should hold true in any relationship including that of man and woman.

excerpt from *Earth Wisdom*
Dolores LaChapelle
Guild of Tutors Press 1978

Seasons of Synergy

by Bob Samples,
Cheryl Charles,
Dick Barnhart

There is much to the particle of the universe called humankind. Our cultural journey has given us many messages. We have heard how things have been and how they could be. We have seen a vision of humankind described on the basis of its faults, it inadequacies, and its deficiencies. We are seeing now the emergence of a newer, perhaps truer vision of humankind. A vision that embodies hope, goodness, aspiration, and perhaps a transcendence of ways of knowing that confine the human spirit.

Cultural critics often argue that for us to solve the problems of the present, we must reapply the solutions of the past. We must, they argue, return to the methodologies of logic, of reason, and of rationality. Yet these same critics find it difficult to admit that the current issues facing humankind may well be the result of having applied those methodologies of linearity in the past.

We feel that we are at a point in the history of humankind where logic, reason, and rationality must be revitalized, reenriched, and if you will go along still with our image of gardens . . . refertilized, organically! This is the time to pay as much attention to metaphor, to intuition, and to a cyclical kind of knowing as we do to our well-practiced linear skills. By paying attention to both intuition and reason . . . by seeing cycles as well as lines . . . we can nurture a holistic kind of knowing, and the transformative mind may emerge.

Our basic vision is simple. Education can transform culture. But only as much as the individuals who perform it are transformed. The individual human has worth. The most important part of that worth is worth to self. When one is worthy to self, whole within one's self . . . that person can teach. But basic to this is the realization that we are all on the journey to that wholeness. If we choose to teach . . . we journey in the presence of others. We must each remain aware of the difference between exploitation and celebration. To teach is to celebrate.

Beyond communing, we are talking about reawakening a daily, moment-to-moment sense in all of us . . . reminding us that nature *is* the source. Our good health—emotional, intellectual, physical, spiritual—depends on the good health of planet Earth. All of us as teachers—no matter what our subject-area specialities—can nurture through the activities we choose, the materials we use, and the experiences we provide . . . can nurture this sense of oneness and harmony with all living things.

Human concerns are extending to other species and to the planet itself. The survival of whales, oceanic pollution, and the effect of ozone in the atmosphere are commonplace issues in daily conversations. Spirituality is on the rise. New ways of human affiliation are being explored at the same time ancient and traditional ways are being renewed.

What, then, is the role of education? Is it the way for the world to be saved? Probably not. It is unlikely that education can either save or destroy the world. But what it can be is a model of human freedom and dignity. It can be the womb of humanism. The whole minds of teacher and learner can be nourished and celebrated. The schools can become places where all the human qualities—intellectuality, emotionality, and sexuality—can blend into a lasting spiritual experience. The schools can become sites of the true rites of passage. Not passage into habit-worn, routinized experience. But rather passage into a vision of transformation. A vision that will celebrate the human condition rather than exploit it. A vision that will lead us into lasting harmony with nature.

excerpt from The Wholeschool Book
by Bob Samples, Cheryl Charles,
Dick Barnhart
Addison-Wesley 1977

ACTIVITY

THE WEB OF LIFE

WEB OF LIFE

Time needed: 30-45 minutes
Number of students: 10-35
Concept taught: Interdependence, community, ecosystems, diversity
Materials needed: plenty of room, a ball of string, pictures of animals, scissors, glue, magazines with pictures of plants and animals

1. Have the students create a mural of a forest ecosystem. They may use pictures cut from magazines or their own drawings to show hills, valleys, streams, other topographical features, plants, and animals.
2. Have each student choose from the mural an animal or plant he or she would like to be. Ask the students to make a visual name tag, picturing and labeling the role they are playing. Then, starting with one "plant," ask that student to hold on to the end of a spool of string. Using the mural as a guide, connect a second student to the first. The second student wraps the string around his hand and passes it along to a third. This process is continued until each "organism" is linked to the ecosystem, and the spool is given back to the first student.
3. Now, have students move back and out until all of the slack is taken up and then jiggle the string to feel the system's "vibrations."
4. Ask the students to decide which link in the system is the least important and have that link drop out. Take up the slack again.
5. Continue to remove links which the students feel are unnecessary to the system or which cannot survive when other links are removed.
6. As the links are removed, discuss:
   —What happens when we remove a link in the ecosystem?
   —Can the system withstand the loss of these links forever? Why or why not?
   —What will eventually happen to a system which becomes less and less complex? Why?
   —Were the changes more dramatic when the system was composed of many parts (links) or when it had fewer parts?
   —What generalization might we make about the relationship between a system's complexity (diversity) and its stability?
   —Can you think of any systems which people have or are creating which might be considered ecologically unstable because of their lack of diversity? What might be done to reduce the hazards of such systems?
   —What other webs of life might there be? What about webs of life within your school? Within your community? What about economic webs of life? Cultural webs of life? World-wide webs of life?

BEST COPY AVAILABLE

Late Autumn

Developing A Sense of Place

A crisp fall afternoon, crisp enough to hear the leaves crack when they hit the ground, crisp enough to have a fire in the hearth. Crispness is not one of my memories of Oregon. I remember late autumn days in Chicago when the snow underfoot crunched with every step. That kind of crispness is seldom known here. This day is different, it comes alive in the air, in the wind that bites the face. Protected by window and comforted by hearth and pen I settle into writing and find nothing but an empty bucket of ideas. So like all serious writers I begin to do my thought rain dance, a kind of miniature ritual to bring condensation from the skies of my mind to run down the page and make the readers' eyes become puddles. Part of the ritual involves leaving the chair window and pen behind the recline, letting eyes slowly close themselves in. This time I left my bucket on the table, empty and waiting.

When I returned, the day was gone, replaced with a much more familiar friend, gray skies, darker, wetter and more enclosed. The bucket is overflowing now, and the rains continue to pour from the heavens. I scratch my head and wonder at how much I am a part in creating this rain. Certainly I encourage it, both by liking it and by being proud of it as my heritage. I notice it most when I am away from it. And others notice it most in me then also. But how much is it a part of me and I a part of it remains unknown.

The Northwest Rain which blows off the ocean is well known around the world. Everywhere I have been, from France to Quebec, it has already been as a missionary, creating a kind of mystique about this place I live and who I am. And this seems appropriate, remembering that over ⅔ of my body is made from this rain. I carry it in my veins. It streams down my cheek when I cry. It is most of what moves in my life.

I have thought many times about where this rain is born, where it really comes from. Where in the ocean does the water rise up to fill the pores of the air? Where do the winds first breathe the air back to the land? Beginnings are vague, and yet with persistence I am certain we could find them, like tracing our family tree back and back.

The Bull Run watershed is a catchment area in the Mt. Hood National Forest where the clouds deposit their gifts and the gifts begin the journey through stream and filter and pipe in house and body. It is good water. I know about this area because only a few years ago someone discovered the Forest Service was logging in it, a practice which seemed contrary to its designation as a water supply and there was a strong and vocal public campaign to rectify the situation. The politics of the situation didn't interest me much. But what did was the realization that very few people knew where their water came from. Even less had ever visited the area. This made me wonder. If someone brings milk every day to our doorstep, how long before we forget what a cow looks like. If someone delivers our paper, how long until we forget what a clearcut looks like. These conveniences tend to remove us from direct connections with the natural resources that we depend upon, tend to make it easy for us to gradually forget where we live, what surrounds us, what we're made of and ultimately who we are. This luxury of disconnection is ours alone. ⅔ of the world's people still heat their homes and cook their food with wood. No switches to turn on or knobs to turn.

A lot of what environmental education programs are doing these days is nurturing reestablishment of connections with the underlying natural systems in our lives. These systems are rich with examples of how the universe works. We can choose to study the plumbing in our house, the city's water system or management processes for the watershed. These do not provide the rich learning experience that the rain and stream and river themselves provide. And we can only learn about river, rain and puddle firsthand, from the river itself, from the stream itself, from the rain. To learn about trees and forests do not study the newspaper delivery system, or the lumber mill or even the logging practices. Go to the source for the learning.

Last month I visited a friend in California and got to wondering one day where the water I was drinking came from. Got me to thinking about who made the soil beneath my feet or which of the plants in the garden grew here before people came.

In digging for answers, we not only discovered a great growing sense of place but came across this quiz which helped us gain some perspective on our search. Since much of our lives are spent in trying to gain a sense of belonging in the world, a niche, or sense of place, we feel that beginning to explore questions like these is basic to our building a sense of being home. Is it possible that if we have a new understanding about where we come from that we will naturally become more aware of where we are going?

by Michael Sould

EL NIÑO

Understanding a Natural Phenomenon

by Gene Williamson and Vicki Osis

In my classroom it begins with the "Bathtub Current" and ends with a discussion of diplomatic brouhaha and the sudden rise in the price of dogfood at the local supermarket. However it is taught, the phenomenon scientists call the El Nino sparks the interest of students and allows them to see that the concerns of scientists touch aspects of their lives.

Let us look first at the nature of the El Nino, and then at one strategy for allowing students to understand this phenomenon in terms of parallel experiences in their lives. Eigth and ninth graders may not be able to conceive of the forces at work in the world ocean, but they have played with the forces which move water in a bathtub for years.

The El Nino is a warm ocean current which has a southward set along the coast of Ecuador and Peru. The Spanish name translates to "The Boy Child," a reference to the fact that this current generally develops around the Christmas season. When the El Nino arrives, the upwelling which supports the immense fishery along the west coast of South America is disrupted by the warm equatorial waters. Fish, and the sea birds which prey upon them, either move or die. Under normal conditions, the warm waters extend only part way down the South American coast. In particularly strong onsets of this current, the warm waters penetrate even further into the southern Pacific and occasionally into the northern Pacific as well. According to Dr. Bill Quinn of Oregon State University, only the stronger phenomena are properly termed El Nino.

It has long been thought that El Nino was preceeded by a year of stronger than normal Trade Winds brought about by an increase in the strengths of a high pressure over the eastern Pacific and a low over Indonesia. When this year's unusually strong El Nino developed without a comparably large increase in the Trade Winds last year, scientists were left somewhat at a loss for an explanation. There has, however, been a dramatic drop in the strength of the trade winds associated with this latest El Nino, and most certainly this is a common feature in all true El Ninos.

The El Nino developes in a reasonably predictable manner. Whether or not the Trade Winds have increased in strength, they push water westward across the Pacific, increasing sealevel on the Asian coast and lowering it on the coast of South America. Then, as the Trade Winds weaken, warm water surges back across the Pacific, raising sealevel, warming surface temperatures, disrupting upwelling and generally wrecking havoc along the coast of South America. True El Ninos have developed six times since the turn of the century. Warm waters extended into the Northern Pacific in 1899-1900, 1925-26, 1941, 1957-58, 1972-73 and 1982-83. The effects of the 1982-83 El Nino are widespread. The severe droughts in Australia and South Africa, the wet and mild winter in California, and our own mild winter with its fast moving storms have been attributed to the influence of El Nino.

The most profound effects of El Nino are felt in the waters off Peru. Historically, the Peruvian fishery has been based on the anchovy. With the incursion of warm waters, diatoms which normally flourish in Peruvian waters die. The anchovies die or move to deeper waters beyond the range of Peruvian fishermen. The sea birds, which support Peru's profitable guano industry, die as their food source disappears.

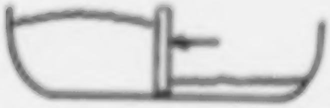
The economic effects of El Nino reach well beyond the Eastern Pacific. With the loss of the Peruvian fishery, the world wide supply of protein is substantially reduced. Demand for alternative protein sources increases and everything from poultry in Pawtucket to dogfood in Denver increases in price.

Leading students to an understanding of this phenomenon is accomplished by relating El Nino to everyday experiences with which they are familiar.

I use a special term to describe any area of the ocean which is elevated above "normal" sealevel by the action of winds, density, continental blocks or Earth's rotation. I call such an area a "hill of water." To understand the hill of water that eventually causes the El Nino, I have my students visualize a bathtub half-filled with water. If one cuts a sheet of plywood to fit the contour of the tub (diagram 1) and then moves the board toward the rear of the tub (diagram 2), one creates a "hill of water." If one then cuts a notch in the center of the board (diagram 3) and repeats the process, water from the hill flows back toward the front of the tub in order to equalize hydrostatic pressure. In this model, the two pieces of plywood on either side of the notch represent the constantly blowing Trade Winds. The back of the tub represents the land block created by Asia, Australia, and the Indo-Chinese Chain. The notch between the boards represents the nearly windless Doldrums, and the stream of water which moves through the notch is analogous to the Equatorial Counter Current. The latter is instrumental in the development of the El Nino.

1

2



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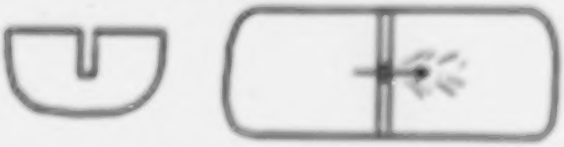


In the Equatorial Pacific, the bulk of the water which builds up against the continental block escapes to the north as the Kuroshio Current, or to the south as the East Australian Current. A small percentage of the water finds its way back through the Doldrums assisted by the weak easterly flow of air in this region to form the Equatorial Counter Current. In years when the Trade Winds weaken, as they have this year, a larger amount of water surges back across the Pacific to bring El Nino to our coast.

Students may have trouble visualizing these processes in the world ocean, but their own experiences with a bathtub make the basic forces understandable. I prepared by students for a recent fieldtrip to the tidepools by showing them slides of the animals we could expect to see. Many of these are rarely found along our coast and the students know they will have to search diligently to find them. At the coast we found that several of these rare animals were suddenly so abundant that we had trouble avoiding stepping on them. I knew I had achieved my goal when one observant student said, "Aha! El Nino."

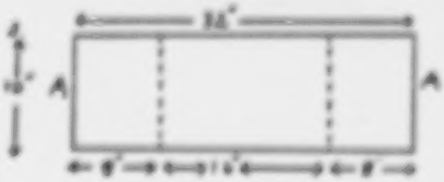
Eugene Williamson teaches science at Cedar Park Elementary School in Beaverton, Oregon, and is current president of the Northwest Association of Marine Educators. Vicki Osis is education specialist at the OSU Marine Science Center in Newport, Oregon. We thank them for their contributions to Clearing.

Materials:
1" mesh chicken wire
wire cutters
heavy duty fuse wire
newspaper and glue
paint

Make A Paper Mache Whale

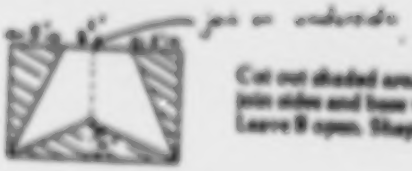
Tail

1. Cut a piece of chicken wire 32" x 10".



Bend under on dotted lines and join A to A with wire.

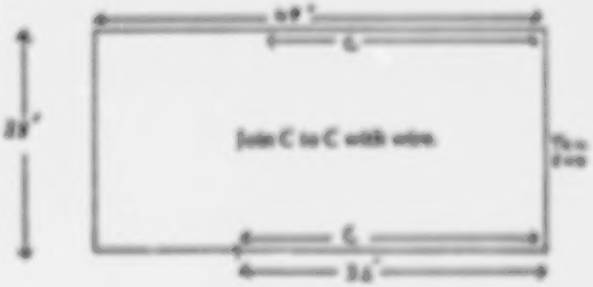
2. Shaping



Cut out shaded areas and join sides and base with wire. Leave B open. Shape.

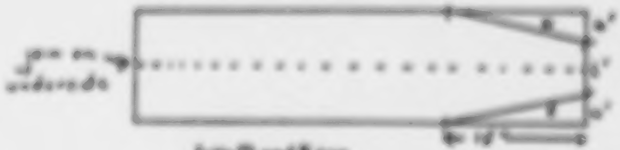
Body

1. Cut a piece of chicken wire 48" x 28".



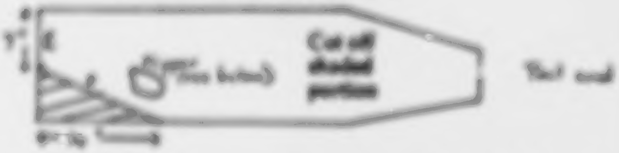
Join C to C with wire.

2. Top View – Shaping Tail



Join D and E top to bottom with wire and shape.

3. Side View – Shaping Head



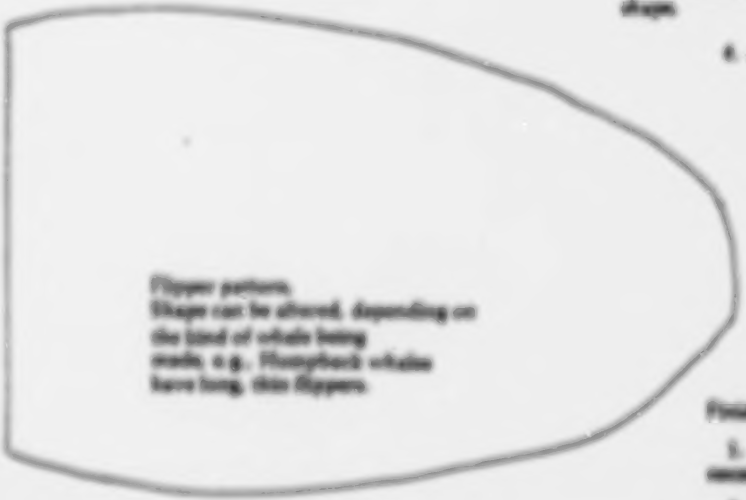
Cut off shaded portion

Curl E under to form rounded face and wire to sides F. Pull into shape.

4. Attach tail with wire. Pull into shape.

Flippers

1. Cut 2 flippers from chicken wire. Attach in position with wire (see above).



Flipper pattern.
Shape can be altered, depending on the kind of whale being made, e.g., Humpback whales have long, thin flippers.

Finishing

1. Cover form with paper mache. Make a dorsal fin if necessary.

2. Paint.

minimum impact camping...

techniques for the new wilderness ethic

1. prepare well

[illegible]

2. management guidelines

[illegible]

3. trekking into the wilderness

[illegible]

4. camping

[illegible]

5. garbage

[illegible]

6. sanitation

[illegible]

7. washing yourself

[illegible]

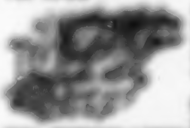
8. washing dishes

[illegible]

9. water pollution

[illegible]

10. fires

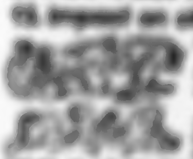


[illegible]

12. color of gear

[illegible]

13. impact on other users



[illegible]

14. become involved

[illegible]

[illegible]

Visions of Wholeness

The man who sat on the ground in his tipi meditating on life and its meaning, accepting the kinship of all creatures and acknowledging unity with the universe of things was infusing into his being the true essence of civilization.

—Chief Luther Standing Bear

Our basic vision is simple. Education can transform culture. But only as much as the individuals who perform it are transformed. The individual human has worth. The most important part of that worth is worth to self. When one is worthy to self, whole within one's self . . . that person can teach. But basic to this is the realization that we are all on the journey to that wholeness. If we choose to teach . . . we journey in the presence of others. We must each remain aware of the difference between exploitation and celebration. To teach is to celebrate.

from The Wholeschool Book

With all beings and
all things, we shall
be as relatives.

—Sioux

From a Gaian viewpoint, all attempts to rationalize a subjugated biosphere with man in charge are as doomed to failure as the similar concept of benevolent colonialism. They all assume that man is the possessor of this planet; if not the owner then the tenant. . . . all human societies in one way or another regard the world as their farm. The Gaia hypothesis implies that the stable state of our planet includes man as a part of, or partner in, a very democratic entity.

This new interrelationship of Gaia with man is by no means fully established; we are not yet a truly collective species, corralled and tamed as an integral part of the biosphere, as we are as individual creatures. It may be the destiny of mankind to become tamed, so that the fierce, destructive, and greedy forces of tribalism and nationalism are fused into a compulsive urge to belong to the commonwealth of all creatures that constitute Gaia. It might seem to be a surrender, but I suspect that the rewards, in the form of an increased sense of well-being and fulfillment, in knowing ourselves to be a dynamic part of a far greater entity, would be worth the loss of tribal freedom.

from Gaia
by Dr. James E. Lovelock

The thoughts of the earth are my
thoughts.
The voice of the earth is my voice.
All that belongs to the earth belongs to
me.
All that surrounds the earth surrounds
me.
It is lovely indeed, it is lovely indeed.

—Navajo

The more uncertain I have felt about myself, the more there has grown up in me a feeling of kinship with all things.

—C. G. Jung

Every atom belonging to me as good belongs to you.

—Whitman

The spirit is yourself, moving in all things.

—Upanishads

A leaf, a drop, a crystal, a moment of time, each partakes of the perfection of the whole.

—Emerson

All truths wait in all things.

—Walt Whitman

The breath of our Earthly Mother
whispers in the leaves of the forest,
billows over the cornfields,
slumbers in the deep valleys,
burns hot in the desert.
Of her you were born, in her you live,
and to her you shall return.

—Essene Gospel of Peace

. . . we are talking about reawakening a daily, moment-to-moment sense in all of us . . . reminding us that nature is the source. Our good health—emotional, intellectual, physical, spiritual—depends on the good health of planet Earth. All of us as teachers—no matter what our subject area specialties—can nurture through the activities we choose, the materials we use, and the experiences we provide . . . can nurture this sense of oneness and harmony with all living things.

The Wholeschool Book

Winter

Quiet and Crystal Clear

"It is winter proper. The cold weather, such as it is, has come to stay. I bloom indoors in the winter like a forced houseplant. I come in to come out. At night I read and write, and things I have never understood become clear. I reap the harvest of the rest of the year's planting."

The drop of water rain that races down to splash in puddles of autumn, or the waiting earth below in spring, becomes a new adventure in winter. Somewhere in its journey from the top of the sky, it finds a point where conditions are perfect, and in a kind of magic that never ceases to hold me in awe, transforms itself to crystal. Always six sides and never the same. Each drop of water, like each thought, becomes its own crystal, brings its own understanding. As I watch the snow falling onto the windowsill, I notice how snow falling changes the whole mood of the countryside. Rain pours down and splashes; snow floats and drifts, settling in gently. A whole new rhythm. Rain brings noise, taps and drags; snow brings the quiet blanket. Somehow snow consumes the noise that is around it.

"It snowed, it snowed all yesterday and never emptied the sky, although the clouds looked so low and heavy they might drop all at once with a thud."

I wonder about thoughts that fall from my clouded mind and the conditions needed to turn them from drops to snowflakes. Winter does that somehow on its own. Thoughts crystallize, consuming the noise and changing the rhythm and mood. Here in the valley, snow comes and goes, falls, drifts and melts. Water keeps flowing, moves itself regularly. But in the hills and mountains snow piles up. Crystal upon crystal, snow piles, building glaciers for the late summer when the earth is dry and thirsty.

Occasionally I hear a snow ski report on the radio. "Mt. Hood base with 8 inches new snow, powder, and clear skies." Whether it's a good time to ski or not, I rarely need to know, but the reports mean so much to my hopes for other parts of the year. Will there be enough snow to carry through to summer's end, will the ponds stay filled high enough to water the garden and fields?

In Sand County Almanac, Aldo Leopold tells us:

"Each year, after the midwinter blizzards, there comes a night of thaw when the tinkle of dripping water is heard in the land. It brings strange stirrings, not only to creatures abed for the night, but to some who have been asleep for the winter. The hibernating skunk, curled up in his deep den, uncurls himself and ventures forth to prowl the wet world, dragging his belly in the snow. His track marks one of the earliest datable events in that cycle of beginnings and ceasings which we call a year."

Leopold's 'night of thaw' is not unfelt here in the Northwest. Many of the native tribes in this region share a similar story about the Chinook warm wind that blows in early spring and melts the snow from the hills in one night. Once the warm wind comes, the new cycle of the seasons, like the melted snow, begins to flow down from the hills; the earth and all its sleeping creatures start to awaken.

From that point on, it is all downhill to spring. The sap begins to run, the buds begin to swell, the first hardy flowers of skunk cabbage poke up through the moist soils in secluded swamps, and there will be moist days when the rich scent of exposed earth will float in the air for the first time since fall. At night, once more the huge sickle-shaped neck of the Lion will rise in the east, and the full 365-day cycle of the year will be completed."

Developing Your School Grounds

A NEW LOOK TO AN OLD PROGRAM

Paul Hansen, USDA Forest Service
Erica MacDonald

The overall objective of school site planning is to develop the school site for use in environmental education. Through such development, the school site should become a model of sound environmental practice from which tomorrow's leaders can develop the skills and solutions to adequately manage tomorrow's resources.

There are many benefits that can be derived from a properly developed school site, the most important of which is probably educational enhancement. In addition to the advantages of having the ideal classroom for environmental studies right in your own backyard, the development and maintenance of the site can have educational value in itself. A well designed school site can enhance many facets of the classroom curriculum through different and often times more informal experiences and thus prove to be an invaluable addition to the traditional curriculum. Such experiences also help put students in partnership with their environment.

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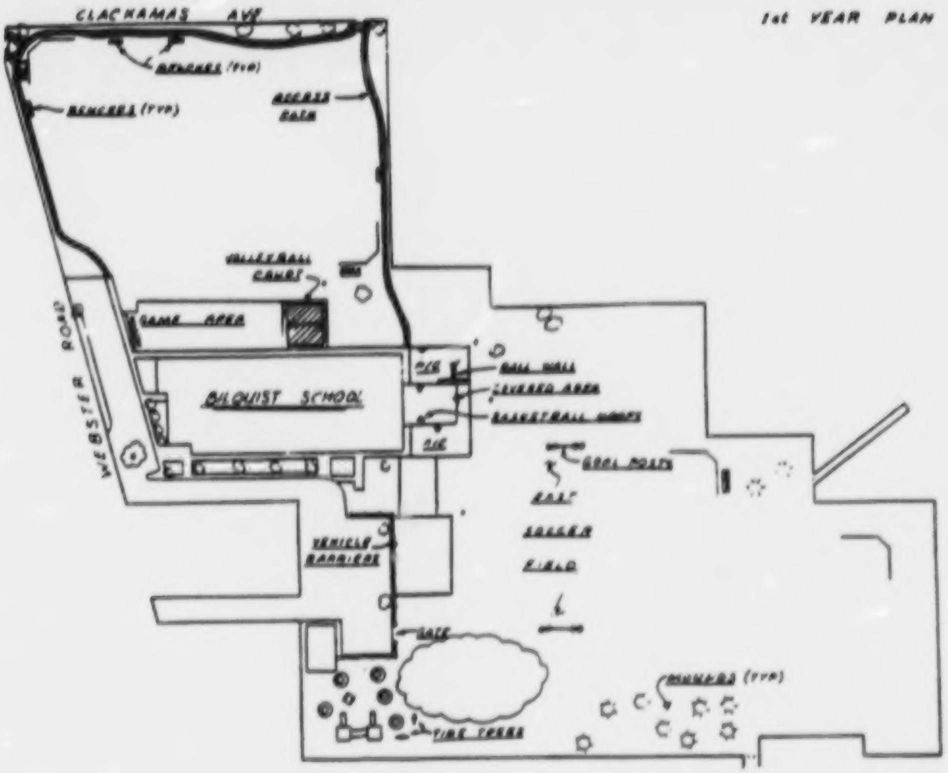


Portland mobilized her students to get a city street blocked off and turned into St. Francis Park. "Kid" power then turned the vacant park into a wonderland arboretum for the Buckman neighborhood.

When **Don Emberlin**, Director of Elementary Education for **North Clackamas School District**, was Principal, he encouraged teachers, parents and students to plant and identify over 80 trees. He cooperated with the City of Milwaukie to build a tennis court, picnic tables and B-B-Q grills in one corner of the schoolyard. Benches were installed around the playground; fathers built birdhouses. One area was fenced off, left to grow wild and attract small animals and birds for study.

Don, as Director of Elementary Education, has since been responsible for intitating district-wide support for school site planning in North Clackamas School District.

There are many other examples of environmental study areas in most communities such as **John Innskeep Environmental Learning Center in Oregon City; Louise Marshall Outdoor Laboratory, Edmonds, Washington; Oaks Bottom, Portland**; and the list goes on and on.

Let's look at a process than can enhance your school site planning program. The first step is to organize a school site planning committee. Who should be on that committee? Determine whose support you need to insure acceptance and commitment to the idea. Key people include: parents, teachers, principal, maintenance dept., custodians. As a school committee meets, they commonly spend two or three meetings getting acquainted, discussing specific school site probelms, and politicking for individual wants and needs.

At one school the committee's first concern was high water. The school lays in the bottom of a large geologic bowl. During the winter, rain runs down the hills and collects in the schoolyard at the bottom.

Since this was all they could talk about, the committee's members started feeling that little else was being accomplished.

Near the end of the second meeting they plotted a planning process on their chalkboard. The diagram had five circles with a few connecting arrows. Once on the blackboard the committee was able to visualize all the things to be done and easily focused on specific tasks. Because they had established a process, they were able to jump right into planning and accomplish more in a shorter time. The water problem was put in perspective as only one thing to deal with.

The basic planning process they developed has 5 major steps:

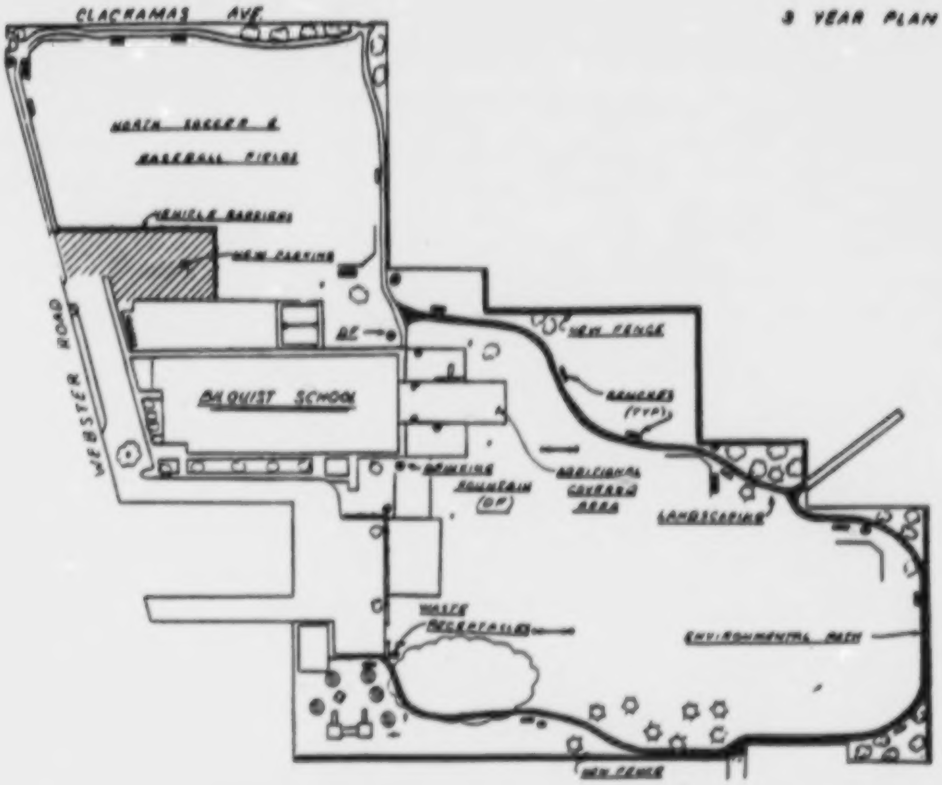
Inventory of
what exists
on site

Audit of
what every-
one wants

Master Plan
Planning
Decisions
and
Priorities

10-Year schedule
for implementing
the plan

Implementation and
Maintenance Plan
Curriculum
Development



The inventory and the audit can be done at the same time. Each of the next three steps can begin only after the preceding step is finished. A committee meeting twice a month, using a process like this can produce a plan in about six months.

Many committees take poetic license with the process. For example, a couple of schools had incomplete site plans or maps and had to draw from scratch. So in the inventory stage students went outside with measuring tapes, compasses and cardboard box plane tables. They located buildings, fences and boundaries. Through triangulation, they accurately mapped trees and equipment. Parents and teachers, with experience in drafting, took the measurement and information and produced a clean, scaled drawing.

The usual method used in the audit is a note or newsletter home, asking parents what they would like on the schoolground. The students at one school took video interviews of fellow students in classrooms. Committee parents in another school canvassed local businesses and government agencies, asking for needs. Still another school used part of a parent/teacher meeting to get input.

During the master plan decisionmaking stage, committees need to develop several alternatives. One committee divided into four groups of three members. Each group developed a rough site plan. When the whole committee met again, they looked for similarities in the four plans (alternatives) and made decisions where differences existed.

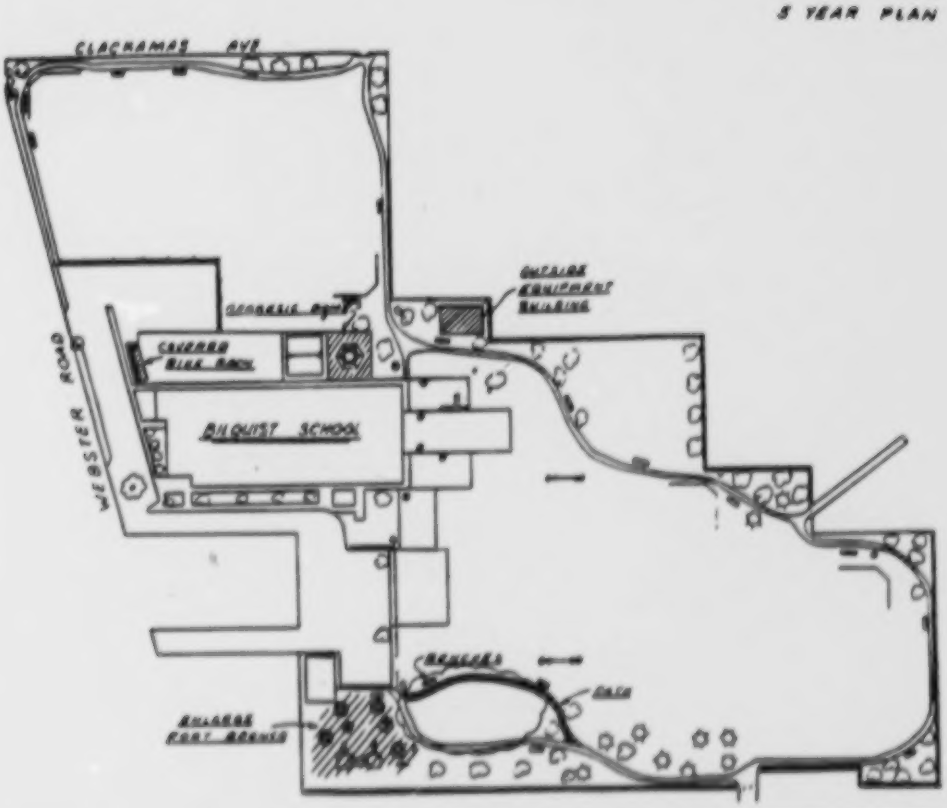
North Oak Grove school used an Artist-in-Residence program to introduce the process to students. Elijah Mirochnik, urban designer, visited the school for a week. Nine sixth graders followed the planning process and built models of how they felt the playground should look. They presented their models to fellow students, then to the school site planning committee. The adults on the committee were very impressed with the students' ideas and made several major changes in the final plan for the school.

North Clackamas held two In-Service courses where school committees attended six sessions. The committees started their inventory and audit during evening sessions. One Saturday was spent on making planning decisions and checking them out on the ground. Another session concentrated on matching curriculum to playgrounds and outside areas close to the school.

A short time after Sunnyside school finished its plan and got it approved, classes planned for a two day kick off. Bob Orr and Lindsay Clark, one of the teachers, bought trees and plants. A crew from the physical plant dug large holes around the playground with an auger on the back of a tractor.

Then for two days, shovel-bearing kids, tracking mud in and out of the school, planted trees and shrubs. *Everyone* participated. Fatsia japonicas, rhododendrons and a magnolia went into the courtyard. A large sycamore and several other big trees were planted on the south side of the school. Oregon native trees and a pine grove appeared in another little used area.

Campbell School students invited the Mayor of Milwaukie to their kickoff. She helped plant five dogwoods, the city tree, in front of the school. All of the



students, class by class, dug holes with hoedads and planted 200 seedlings to start their school forest.

Bilquist began with a parent designed and funded jogging trail. Clackamas built an improved walkway between buildings, with planters, shrubs and benches. Battin School dedicated a new sign, installed next to the front walk. Oak Grove and Clackamas buildings were beautifully repainted.

An interesting note about school site planning—even during hard economic times, things get done. Parents, teachers, administration and students work together in grassroots fashion to accomplish common goals and the whole community benefits. Schools are being beautified and improved. People are learning to plan for themselves. Communities are inheriting useable facilities where parks are scarce. And, kids are getting a better environment, an environment in which to play and learn.

WHO SHOULD BE INVOLVED?

In order to gain the support and commitment necessary for this type of project, it would be helpful to involve (to some extent) as many people as feasible and as early in the planning process as possible.

You may only need acceptance of the idea with some involved, but whole-hearted support of other key persons, like the principal. It may be a good idea to start thinking of people whose particular talents may be beneficial to the development of the site plan. For example, shop teachers or others with drafting experience would be useful for developing site maps and layouts for the site.

Among those that should initially be involved are:

- parents
- teachers
- principal
- school district
- students

Keep in mind that the school site concerns many people in the community, so try to involve as many interests as possible. Others that you might wish to include in the planning process include:

- custodial/maintenance personnel
- community members—especially those that may live adjacent to the schoolgrounds
- Little League and/or Soccer League representatives
- any other community organization that may utilize the site.

DEVELOPING THE INVENTORY AND AUDIT

Knowing your school site is important. The primary purpose of the inventory is to find out what features presently exist on the site. This will enable you to eventually determine what can remain on the site, and what must be changed, modified, or discarded. It is also helpful in determing whether your proposed changes are feasible (for example, you can't plant a tree where a sprinkler valve is located).

You may want to consider some of the following as a starting list for your inventory:

- dimensions of total grounds and school building
- acreage
- boundaries
- school enrollment—present and projected
- playground equipment
- parking, roads, sidewalks, fences
- play areas
- lawns, shrubs, trees
- wildlife areas
- soil analysis—quality, erosion
- water analysis—waterfall, drainage
- traffic patterns (student use patterns)
- police/fire needs
- maintenance of schoolgrounds
- historical landmarks
- outside groups use of site (eg., Little League)
- applicable government/school district regulations
- topographical features
- relevant background information

Much of the inventory can be done with the resources you have at hand. Teachers and students can develop lists of many of the site features (eg., playground equipment, plants, animals, boundaries, etc.). Teachers could even assign classes to develop a base map with these elements.

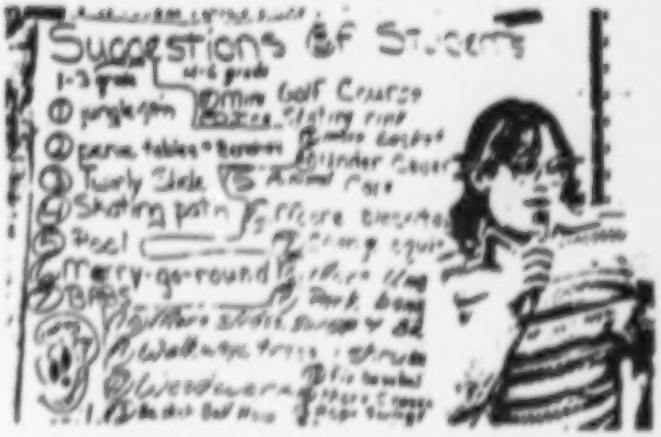
Government agencies (federal, state, county, city) often have information regarding soil and water analysis, community projections, government regulations, identification of plant life, and historical landmarks.

Topographical maps, aerial photographs (available at your local library), and base maps of the school site are helpful aids in generating the inventory.

PLANNING FOR YOUR SCHOOL'S OWN BACK YARD

Sometimes what we were looking for was right there in our own backyard! This old adage has taken on a whole new meaining for those who have discovered that the school yard is fertile with potentials waiting to be reaped. What the community discovered, in their own back yards, at the North Oak Grove Junior High was more than grass and shrubs. Parents, teachers, kids and school administrators have developed places for play, elements for elderly, projects for participants, nature for the novice and curriculum for the classroom.

During the week that I spent at North Oak Grove, as the Architect-In-Residence, it became clear what ingredients were needed to turn students on to a project that their parents were already very excited about. I call this list **The Back Yard Curriculum Pack** and its ingredients, for making the plan of a school grounds a class project, are as follows:



1. **Roles:** Assign students the role of Architect. Set up a time and place for a presentation of plans to parents and other students, if possible. At North Oak Grove the entire school met in the cafeteria and the class of Junior Architects presented their plans. From the start the class understood that this was not theory, this was for real!

2. **Inventory:** Using polariod cameras or sketch pencils and pads, have students document what the school grounds look like. Paste photos or sketches onto a poster and have each accompanied with a written description.

3. **Interviewing:** Part of the Architect's job is to ask the client what *they* want. So, get out the video or cassette recorders and have a select number of students, from other classes, come in for an interview. Questions should be developed beforehand. Notes should be taken during the interview.

4. **Brainstorming:** Get out a long sheet of butcher paper, hand each Architect a crayon and ask that their THINKING CAPS be put on. Fill the sheet with sketches, ideas, fantasies, words, names and numbers. No idea is unwarranted during this stage of the design.

5. **Model Building:** Have students develop their specific plans in simple model form. Using posterboard or cardboard as a base, each student, or team of students, must design play equipment or a landscape. Clay, straws, styrofoam cups, plastic spoons and toothpicks are but a few items that can make great model elements.

6. **Rehearsal:** Now that they have a plan the class must, as Architects do, sell their ideas! Rehearse a presentation where all the parts of the design, from Inventory to Models, are revealed.

7. **Presentation:** Now spread the word at an assembly or a meeting with a local school board. And remember to ask your audience for a response. Architects are always looking for new ideas!

Why involve students in a school grounds planning project? The answer is simple. Student involvement could be the incentive that a parent needs to take up the subject with the school board or city council. Parents' voices are always listened to by those folks that hold the purse strings that could make the project go. And besides, students will have great fun in playing the roles of Architects planning the SCHOOL'S OWN BACK YARD.

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Support for Built Environment Curriculum from National Endowment for the Arts and The Chalos Foundation

Horse Chestnuts

In my suit jacket pocket are a couple of horse chestnuts picked up months ago on a back street. The asphalt was littered with spiny husks and the remains of nuts that cars had run over, but in the gutter I found two burrs that were still intact, inside each a pearl of oiled and polished mahogany.

Horse chestnuts have always been worth having. As children we filled empty shoeboxes with them, or our top bureau drawers. What prompted the annual hoarding was not their taste. Some of us tried repeatedly to eat the hard white meat and were beaten back by bitterness every time. Nor were horse chestnuts very useful. Drilling holes in them and tying them on opposite ends of pieces of string turned them into bolas, but you had to be better aim than mine to wrap a bola around a telephone line. Finally, while horse chestnuts never rotted, they quickly lost their initial luster, shrinking and wrinkling until they resembled the dried litchis that Chinese restaurants serve for dessert. None of this, however, made horse chestnuts any less desirable, for none of us thought to question their worth. Every September I scaled the horse chestnut in the church parking lot, raised up its rough trunk by faith, pure and simple.

I have outlived both the church and the tree — one burned, the other sawed down — but I still collect horse chestnuts. My pulse no longer quickens at the prospect of gathering a whole half bushel of them, and my top bureau drawer holds nothing but underwear and socks. Yet each fall, whenever I find the curled, yellow, palmate leaves and spiny husks lying on a sidewalk, I stop to find a couple of unblemished nuts, round ones perhaps, or a pair flattened on one side from having shared a bur with a sibling. Pocketed, they travel with me.

Thirty thousand feet above sea level, in a fragile cocoon of aluminum and plastic, a briefcase full of papers wedged in under my feet, it is easy to think globally. The headlines of today's paper folded in the seat pocket in front of me warn of nuclear war, acid rain, and empending energy shortages. Down below me are chemical dumps leaking, tropical forests burning, whales dying, humans being born. All round me sit experts, their attache cases filled with reports, charts, bar graphs, and color transparencies.

But in my pocket are two horse chestnuts. I touch them and I am under the back porch, feeding ant lions in their conical pits. One touch and I have a raft on wheels and a matched set of kitchen strainers to sein for water striders and tadpoles. One touch and it is summer vacation and I am going to grow up to be a taxidermist. In whatever stratosphere of world issues I find myself, the horse chestnut brings me back to earth.

Horse chestnuts will not work for everyone. But other grown-ups, I notice, have their equivalents: the tail feathers of a red-shouldered hawk, a glass bottle filled with beach sand, a lump of copper ore that doubles as a paper weight. Each reminds someone of a place and time when, whether they know it or not, they had both feet firmly on the ground, a reminder that is the most subtle, and yet the strongest form of encouragement. Horse chestnuts are my talisman. In the rarified atmosphere of world responsibility, I find that they work a simple magic, reminding me what it is exactly that I have grown up to care for.

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Roger B. Swain

Marine Education — *Exploring the Coast*

ESTHETIC COAST EXPERIENCES

1. Look at a sample of sand under a microscope. Compare dune sand to river sand.

2. Find two beach pebbles exactly the same size.

3. Make a collection of bits and pieces of plastics found in the driftwood. Make an ugly collage or an ugly necklace.

4. Get rope, string, and wire brads. Make a giant driftwood mobile.

5. Place a cupful of dried beans just into the water and watch how wave action moves objects. Come back in 15 minutes and see what's happening.

6. Ever notice how many logs are chainsaw cut on the beach? How did they get there?

7. Bring a large garbage bag and help clean up a beach.

8. Drag a magnet through the sand. You might be surprised.

9. Count 100 waves. Value your meditation.

10. Graph 36 hours of tide using a tide chart.

11. Think about the relationship between wind, waves, and dunes.

12. Make pickles out of "Bull kelp" Nereocystis leutkeana. (Write Cape Perpetua Visitor Center, Yachats, OR for information.)

13. Dig clams and chowder, roast in shells, fritter, deep fry, etc.

14. Rent a crab pot and go crabbing.

15. Count the waves per minute crashing against the tide pool animals. How many times do they get slammed by waves a year?

16. Build a sand castle near the uppermost edge the last wave reached. When finished with your sun castle, make a statement about tides.

17. Do some sand casting with plaster of Paris or wax.

18. Find something there is a million of and prove it.

19. Measure the temperature of the dry sand, wet sand, air, water, and you. Write the temperatures in the sand.

20. Investigate holes in the sand. What makes them?

21. Make a sand and driftwood dam across a temporary stream of water on the beach.

22. Look under a few rocks during low tide. Replace them.

23. Listen to the barnacles during low tide.

24. Do all star fish have the same number of legs?

25. Feed a submerged sea anemone some meat, paper, tinfoil, penny. Try your finger.

26. Find an abandoned animal home.

27. Turn a starfish over onto its back and watch it for 15 minutes. If you get bored, return him home.

28. Obtain a copy of Oregon's Captive Clams from Oregon Sate University Extension Service and learn the names of the six edible clams in Oregon.

29. Compare the typically leathery, hairy, fleshy or waxy leaves of sand dune plants (deserts) to the leaves in a forest.

30. Find a place where sand is being removed (erosion) and another place where sand is being deposited (deposition).

31. Have a contest on who can build the tallest mound of sand inside circles of one foot in diameter.

32. Make an alphabet inventory of a tide pool. C = crab, W = water, R = rock, etc.

33. Listen with your eyes closed and write down all you hear.

34. Have a trust walk through the driftwood. Two seeing leaders on each side of the blindfolded person. Take turns. Go slow. Be careful. TRUST.

35. Have a flat beach rock stacking contest. How high or how many?

36. Make a giant beach mural. Use rocks, sand, driftwood, etc. Make this a group project. Let Mother Nature erase it with the tide.

37. Get an official Oregon state road map and systematically visit every state park.

38. Try your hand at sketching a seascape.

39. Find any fibrous material (natural or man-made) and braid it.

40. Boil away a quart of seawater and see the salt.

41. Catch a beach hopper (tiny anthropods) hopping near rotting seaweed. Look at one through a magnifying glass.

42. Write a billboard size poem to the sea gods in the sand, thanking them for the ocean.

SAFETY AT THE BEACH

Any teacher planning to take a field trip to the beach should be aware of the potential dangers which may be encountered there. Drift logs, steep and crumbly trails, treacherous waves, and incoming tides all must occupy a leader's attention. The following advice comes from the long experience of the staff of the OSU Marine Science Center.

1. Take only a group of manageable size. One adult for every ten students is a good ratio.

2. Be sure the students are dressed properly for the trip. Long pants and tennis shoes (or rubber boots) are a must. Remember: it's almost always chilly at the beach.

3. Be sure a first-aid kit is available to care for minor cuts and abrasions that are likely to occur.

4. Visit the site of the field trip before the trip date to become familiar with the area the group will visit.

5. Study the tide table; plan to arrive at the beach an hour before low tide. It is safer to be on the beach with an outgoing tide.

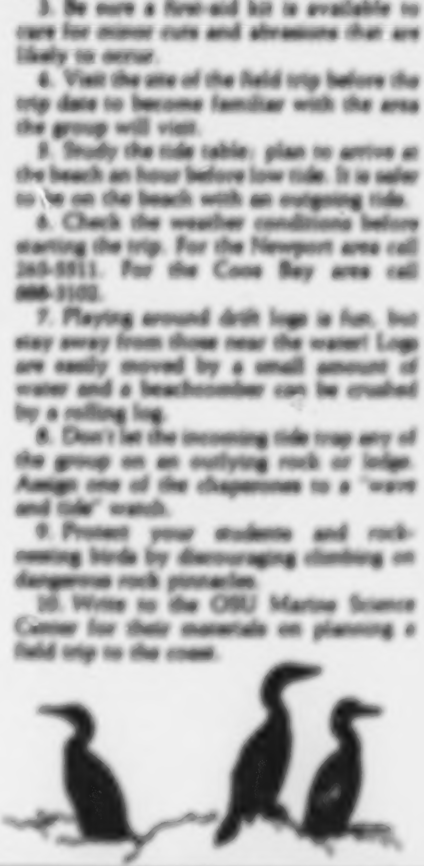
6. Check the weather conditions before starting the trip. For the Newport area call 265-5511. For the Coos Bay area call 888-3102.

7. Playing around drift logs is fun, but stay away from those near the water! Logs are easily moved by a small amount of water and a beachcomber can be crushed by a rolling log.

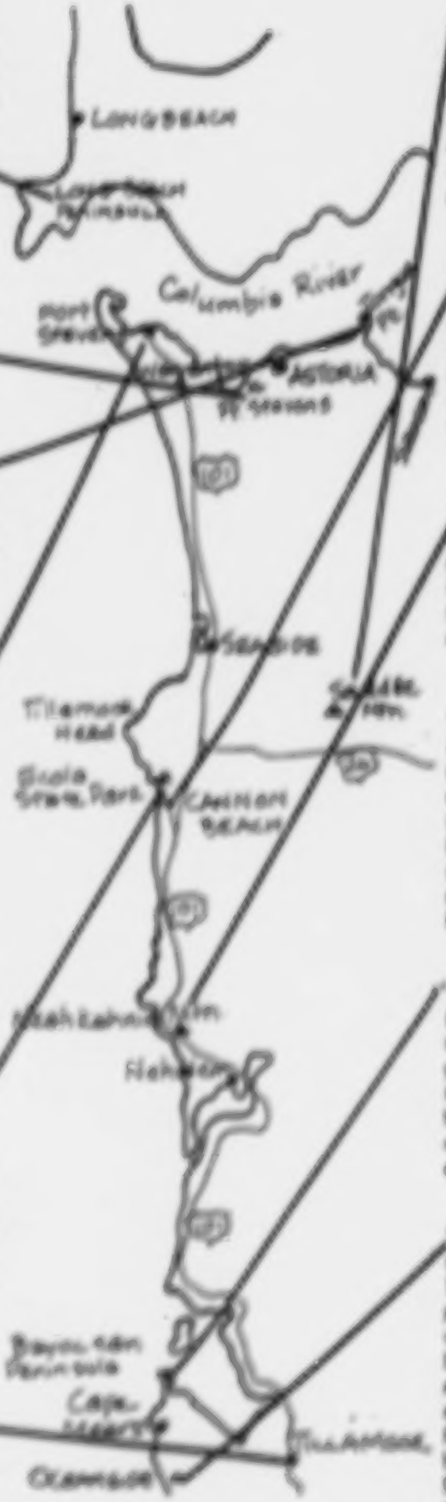
8. Don't let the incoming tide trap any of the group on an outlying rock or ledge. Assign one of the chaperones to a "wave and tide" watch.

9. Protect your students and rock-nesting birds by discouraging climbing on dangerous rock pinnacles.

10. Write to the OSU Marine Science Center for their materials on planning a field trip to the coast.



NORTH COAST



***Long Beach Peninsula, WA —**
The area from the mouth of the Columbia R. & along the shores of Willapa Bay to the north is the most unique and outstanding birding locality on the Oregon and Washington coasts, being a major migration stop for waterfowl and shore birds.

***Ft. Clatsop**
(Astoria) National monument to Lewis & Clark with visitors center and a program for school groups.

***Tongue Pt. — Svenson Area**
(east of Astoria, along the Columbia R.) One may observe extensive flocks of Whistling Swans from Nov.-March on the islands in the river. Also important wintering spot for Bald Eagles.

***Ft. Stevens State Park**
(10 mi. west of Astoria) Diversity of habitat reflects diversity of birds in this area. Ecological succession of dunes to spruce forest can be seen.

***West of Hammond and Warrenton**
and from Ft. Stevens State Park to the Columbia R. stretches grass, dunes, marshes, fir trees and open beaches. The contrast in habitat makes this an outstanding birding area.

***Ecola State Park** (2 mi. north of Cannon Beach) Many birds nest so close to the lookout point that no glasses are needed to watch them feed their young. In large stands of fir are many deer and Roosevelt Elk. Excellent trails to the beach; few tidepools.

***Tillamook Pioneer Museum**
(Tillamook) The museum has a variety of antiques, wildlife habitat panoramas and natural history displays.

***Saddle Mt. State Park**
(just north of U.S. 26, 9 mi. east of junction with U.S. 101.) Bird life of the Northern Coast Range is well displayed here. The 3,283 ft. mountain, a volcanic remnant, is easily scaled, giving superb views over northwest corner of the state. Elk and deer are also common here.

***Haystack Rock**
(Cannon Beach) Offers an outstanding scenic view of several of Oregon's "sea-stacks" and has a large breeding bird colony just offshore. Variety of tidepooling is limited, but is ample for younger students.

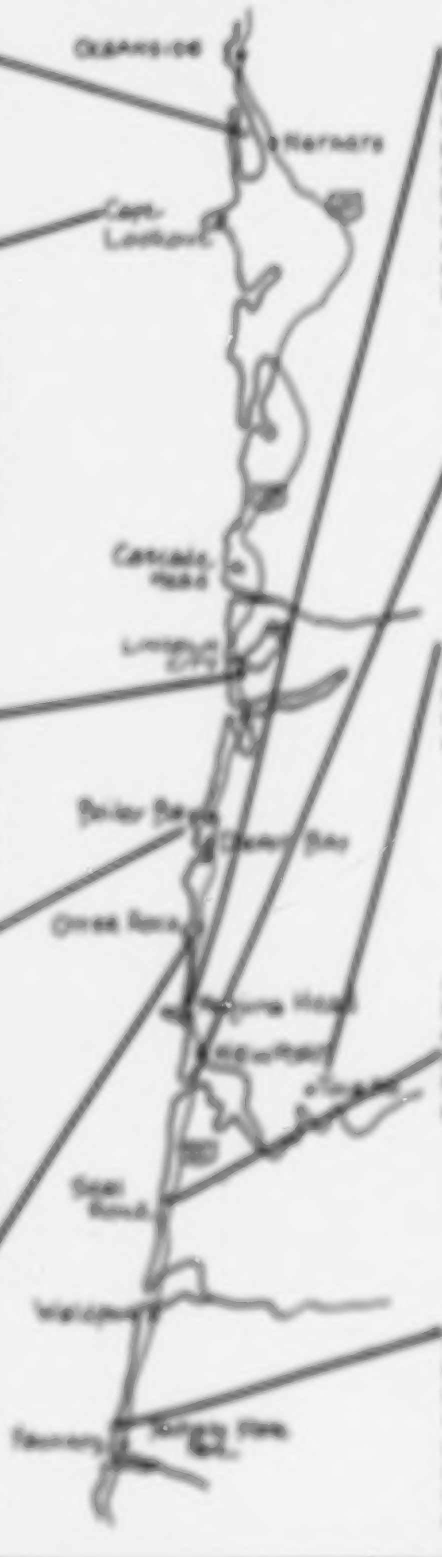
*The highway climbs high over the shoulder of **Neahkahnie Mt.** on U.S. 101 giving superb views of the coast. Migrations of California Grey Whale may be seen, Nov.-Dec. for southern movement and March-April for return.

***Cape Meares**
(10 mi. west of Tillamook) Access to intertidal area is at Short Beach, a mile north of Oceanside. Parking is limited and the area not suitable for large groups. During migration season this is a good shore birding area. Brown Pelicans are regular late summer and fall visitors. **Cape Meares Lighthouse** can be visited.

***Bayocean Peninsula**
(near Cape Meares) This peninsula runs to the north on the right side of the road and a gravel road allows driving for 1½ mile along the dike. Here among the mud flats and bay on the right and sand dunes and beach on the left one may find good birding, especially during the migration season.

***Three Arch Rocks National Wildlife Refuge**
(Oceanside) These rugged islands, totaling 17 acres, support an enormous nesting population of Common Murres together with smaller groups of Forked-tailed and Leaches Petrels, Double-Crested Brandts and Pelagic Cormorants, Tufted Puffins and many more. Though the islands are too far for good views with a telescope, the birds may be seen fishing just offshore. Steller Sea Lions also occur regularly on the rocks.

CENTRAL COAST



*Netart's Bay(south of Oceanside on Rt. 6) Being somewhat shallow, the bay attracts large flocks of Black Brant and other waterfowl in winter.

*Cape Lookout State Park
(10 mi. south of Tillamook where Rt. 6 ends) May find mountain-loving birds here. Townsend's Warblers have been seen in migrations. Intertidal zone is found off Camp Clark. It is a good location for smaller groups. Access is through Boy Scout Camp so permission to trespass must be obtained from the Camping Dept., Columbia Pacific Council, Scout Service Center, 2145 SW Front St., Portland, OR 97201 (226-3423).

*Roads End
(take last left from Hwy. 101 at shopping center at North end of Lincoln City) Rocks at north end of beach have a dense biotic population. There are shelves, channels and the effect of sand movement can be seen in geology of the area. Parking is limited.

*Boiler Bay
(1 mi. north of Depoe Bay) Ample parking is available at Boiler Bay State Park. Trail down to intertidal area is steep. West of the trail the shelf area is reduced and interrupted by tide channels. Good area for any students, but area is in danger of overuse.

*Marine Gardens at Otter Rock
(8 mi. north of Newport) Bus parking is available at Devil's Punch Bowl State Park. Channels paralleling the shoreline, breaks in the shelves. Numerous tide pools. Excellent for field trips.

*Yaquina Head
(North Side — 4 mi. north of Newport) Rocky outcroppings, shelves are widespread and cut up by tide channels and pools. Fair number of migrating birds in the fall. Irregular stop for Whimbrel. Lighthouse at Agate Beach, built in 1873, offers nesting for birds in offshore rocks in spring and summer. One of the houses at the lighthouse has been converted into a laboratory for use by school groups.

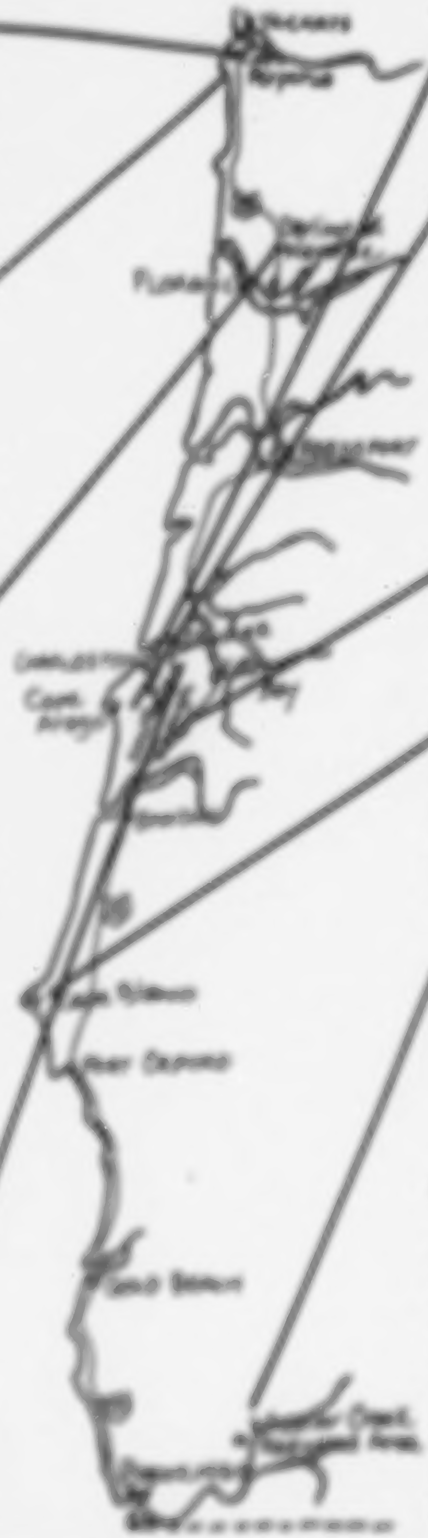
*OSU Marine Science Center
(Newport)

*Toledo
(11 mi. to the east of Newport) Along this stretch a variety of shorebirds and fresh-water ducks can easily be seen from the roadway.

*Seal Rock
(12 mi. south of Newport just off Hwy. 101) South from the State Park a combination of cliffs and bedrock are found intertidally. Sandy beach is found south of the headland. This is a good place for school groups.

*Yachats State Park
(north of the mouth of the Yachats R.; from Hwy. 101, turn west on 2nd St. in Yachats) From large parking lot in park, several trails lead to the beach and rocky intertidal areas. Channels, small caves and tidepools are numerous. Surf can be a problem in this exposed area and must be watched carefully.

SOUTH COAST



***Cape Perpetua**

(3 mi. south of Yachats) Along the base of this massive mountain runs a shelf of varying width exposing some intertidal shelf areas with tidepools, caves & channels. The U.S. Forest Service has a Visitor Center with Educational Exhibits and films, as well as maintained trails to intertidal areas. Naturalists available to lead hikes to tide pools and forest for ecological study.

***Neptune State Park**

(13 mi. south of Waldport on Hwy. 101) It forms the southern part of Cape Perpetua and has varied intertidal areas. The Strawberry Hill section of park has excellent intertidal areas. Basically bedrock with some sandy beaches intermixed, numerous tidepools, channels and crevices.

***Darlingtonia Wayside**

(4 mi. north of Florence on Hwy. 101) Interesting botanical site. A boardwalk runs over a bog in which many pitcher plants grow. Hike through bog takes 15 minutes.

***Sand Dunes**

(Reaching from Florence to Coos Bay) This is the largest dune sheet in the temperate zone of the world. A variety of dune features can be seen and there are numerous lakes.

***Fossil Point**

(Located between Empire and Charleston) The unique region ½ mile inside the mouth of Coos Bay exhibits open coastal flora and fauna. Very restricted parking, best for small groups.

***[illegible]**

Box 5377, Charleston 97420

***Cape Arago**

(11 mi. south of Coos Bay) The North Cove is the largest of the 3 coves in this state park. It is easily accessible from ample parking lot. The intertidal zone is immense, with sandy beach, bedrock shelves and tidepools. There is also a Middle and South cove. Seabirds can be seen feeding and nesting just offshore. A large herd of Sea Lions reside here most of the year.

***South Slough of Coos Bay —**

Estuarine sanctuary relative undisturbed, almost pristine section of the bay.

***Cape Blanco**

(10 mi. northwest of Port Orford) Western-most point in Oregon, has a large intertidal area that is relatively undisturbed. Best reached on north side of cape, before entering the Coast Guard Station. Excellent study site.

***Wheeler Creek Redwood Natural Area**

(20 mi. east of Brookings) Northern-most grove of coast redwoods.

Resources

This brief survey of special places on the Oregon coast was compiled from many sources. While putting it together we encountered a few guides which we feel would be invaluable to any ardent coastal adventurer:

1. A Guide to Oregon's Rocky Intertidal Areas (Oregon Fish & Wildlife)
2. Birdfinding the Oregon Coast (Audubon Society)
3. Places to see and visit on the Oregon Coast (Marine Science Education Trip, OSU Marine Science Center)

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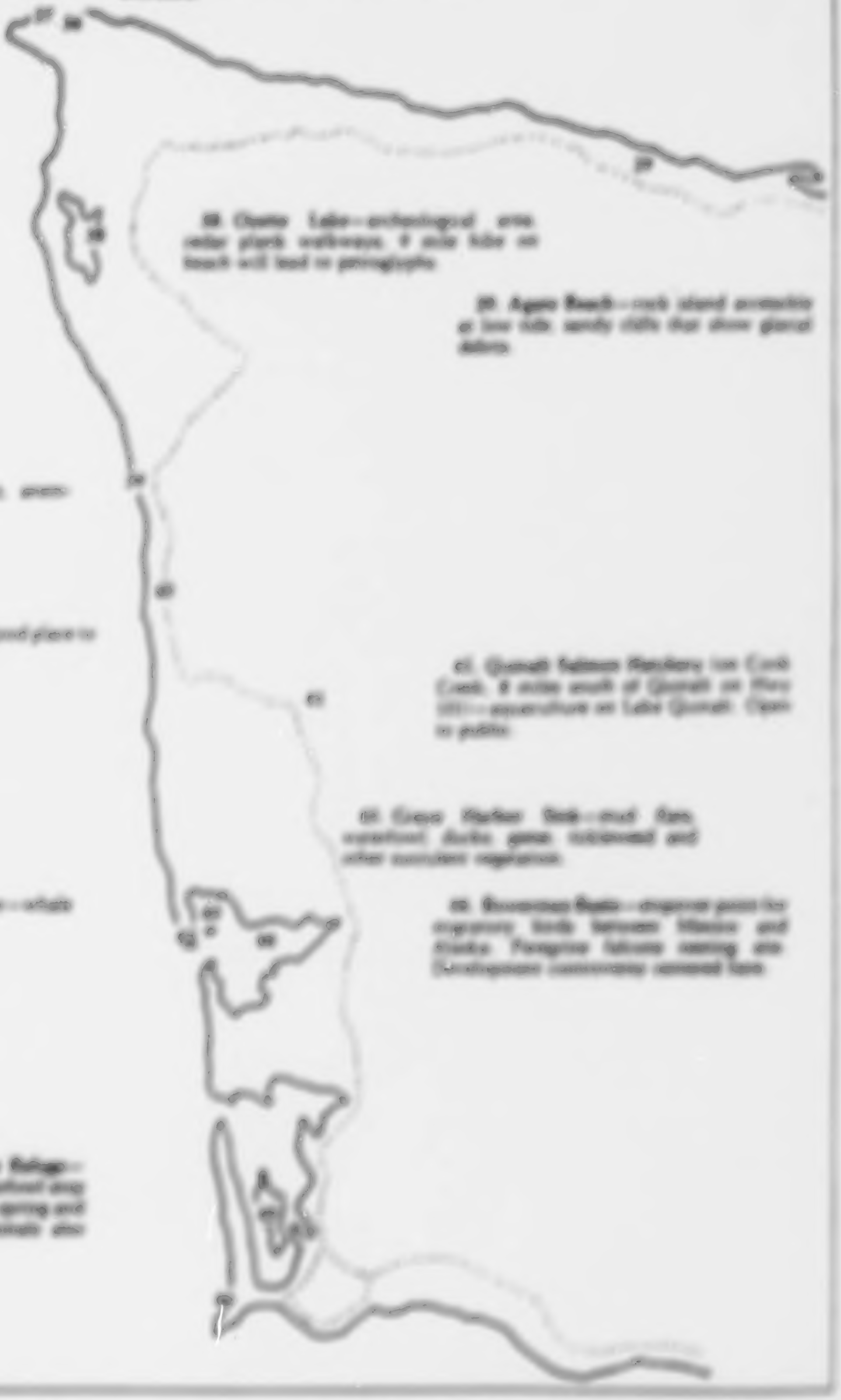
36. Makah Indian Museum (in Neah Bay)—contains exhibit of petroglyphs from NW Coastal Indians.

37. Neah Bay—great place to watch whales rubbing barnacles off against rocky shoreline.



38. Ozette Lake—archeological area, cedar plank walkways, 3 mile hike on beach will lead to petroglyphs.

35. Agate Beach—rock island accessible at low tide, sandy cliffs that show glacial debris.

39. Ruby Beach—rocky shores, anemones, tidepools.

40. Kalaloch—beach trails, good place to look for migrating whales.

41. Quinalt Salmon Hatchery (on Cook Creek, 8 miles south of Quinalt on Hwy 101)—aquaculture on Lake Quinalt. Open to public.

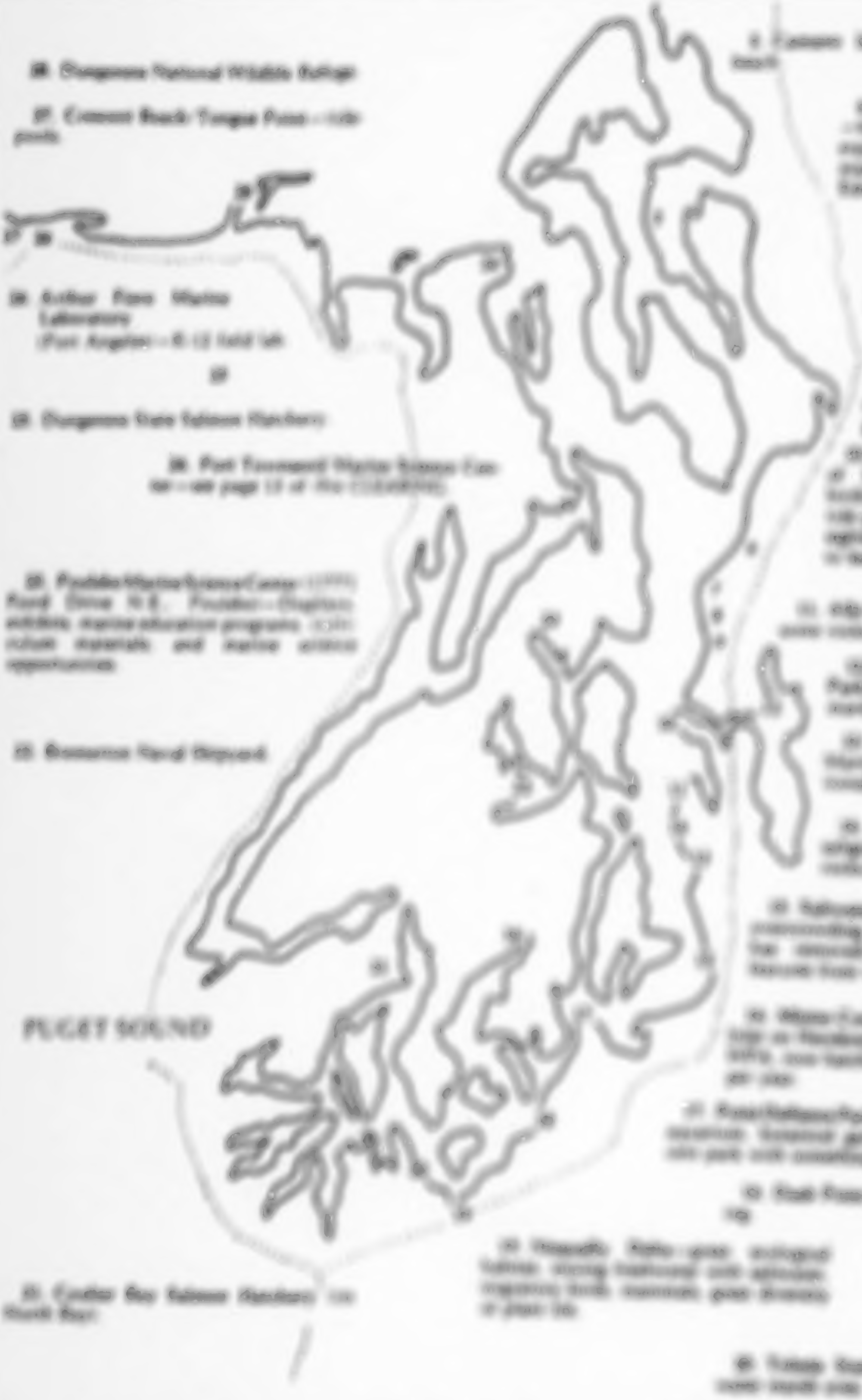
43. Grays Harbor Sink—mud flats, waterfowl, ducks, geese, [illegible] and other succulent vegetation.

42. North Jetty of Grays Harbor—whale watching.

44. Bowerman Basin—stopover point for migratory birds between Mexico and Alaska. Peregrine falcons visiting area. Development controversy centered here.

45. Willapa National Wildlife Refuge—large numbers of migratory waterfowl stop here during migration periods of spring and fall. Mammals and marine animals also abundant.

46. Fort Canby State Park.



38. Dungeness National Wildlife Refuge

37. Crescent Beach Tongue Point – tide pools

36. Arthur Feiro Marine Laboratory (Port Angeles) – K-12 field lab

35. Dungeness State Salmon Hatchery

34. Port Townsend Marine Science Center – see page 13 of this CLEARING

33. Poulsbo Marine Science Center: 17771 Fjord Drive N.E., Poulsbo – Displays, exhibits, marine education programs, curriculum materials and marine science opportunities

32. Bremerton Naval Shipyard

PUGET SOUND

31. Coulter Bay Salmon Hatchery – on North Bay

5. Camano Island State Park – sandy beach

6. Edmonds Oil Dock – beach at low tide exposes large variety of marine life; rock jetty at Edmonds Marina

7. Golden Gardens – sandy beach, programs for [illegible]

8. Shilshole Marina

9. Carkeek Park – sandy beach, [illegible]

10. Discovery Park – 2 miles of beach, good spot for birding, [illegible] tide pools on north end. [illegible] 1 mile walk to beach from parking lot.

11. Alki Point – sandy with some rocks north of point

12. Sand Point (Magnuson Park) – wetlands, field area, [illegible]

13. [illegible] County Park – [illegible]

14. Lincoln Park – [illegible] area, low tide exposes rocks

15. Saltwater State Park – [illegible] from the beach

16. Minter Creek Salmon Hatchery [illegible]

17. Point Defiance Park (Tacoma) – Zoo, aquarium, botanical gardens – a superb city park with something for everybody

18. Dash Point State Park – [illegible]

19. Nisqually Delta – great ecological habitat [illegible]

20. Tolmie State Park – [illegible]

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ACTIVITY

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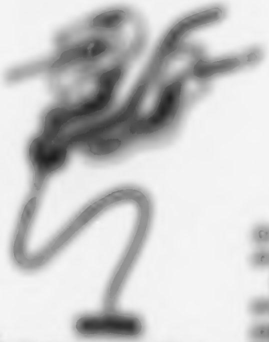

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Teaching Ecology in Winter

[illegible]

regions which experience cold winter weather, organisms' adaptations and ability to withstand the stresses of winter conditions is the most critical ecological factor in their survival. Not to mention the beauty and fragility demonstrated in natural forms created by winter conditions, which can enhance our appreciation of the natural world.

To miss exploring the winter season would be to miss an essential part of discovering the natural world and the lessons it has to teach us during that part of the seasonal cycle.

From Dr. Les Picker, Director of the North Carolina Marine Resources Center, comes a list of ten suggested units that deal with winter ecology lessons. These lessons, appropriate for the secondary level, were tested for their effectiveness, teachability, feasibility, and student involvement. Use these ideas as starting points for creating your own winter ecology lessons, taking into consideration your location and the winter weather conditions.

Snow Insulation and Density

This unit was designed for students to better understand the physical parameters of snow and its ecological effects. Students measured snow temperature at various depths and snow density at several locations. Questions should relate field exercises to key ecological concepts.

Snowflakes and Snow Crystals

In addition to examining the structure of snowflakes and crystals, students were introduced to the life and work of a scientist/photographer. Information was provided on snowflake formation and questions were designed to reinforce an understanding of snow's effects on an ecosystem.

Goldenrod Galls

This study attempted to reinforce appropriate experimental designs and to have students gain understandings of host-parasite relationships and adaptive mechanisms which organisms use to survive the cold weather season.

This was one of two units designed to last the length of the entire winter ecology program. After students gathered the galls and set up their experimental conditions, they observed changes on a weekly basis.

Bird Behavior

This was the second of two units designed to last the length of the winter ecology program. Students constructed their own simple bird feeders from recycled materials, set up and maintained feeding stations and made weekly observations.

Coupled with the observations were a series of readings on specific birds, their behaviors and winter adaptations.

Survival Techniques

Unlike the other units in the winter ecology program, this one was designed with enough flexibility to allow several options for teacher presentations. If used as suggested, students constructed snow shelters, gathered and sampled edible winter plants and learned basic cold weather survival techniques.

Bacteriology and Decomposition

Incorporating a basic introductory bacteriology lab experience, this unit was designed to show students the importance of bacterial decomposition to an ecosystem and that the process goes on continually throughout the year, with seasonal fluctuation.

Students took soil samples, enriched them with a nutrient broth, cultured the bacteria in petri dishes, and incubated them at various temperature conditions. Discussion questions completed the investigation.

Trees and Keying

This unit attempted to introduce the concept of dichotomous keying and reinforce it with lab and field experiences. At the same time the unit was designed to familiarize students with common coniferous and deciduous trees of economic importance.

Students practiced keying, constructing their own dichotomous keys and using a prepared tree key to identify local trees.

Biomass and Productivity

This unit had several objectives. Students studied two ecosystems: forest and pond. Based upon these studies, involving sampling techniques and gross biomass estimates, a comparison was made between the forest and pond ecosystems. From this the difference between biomass and productivity was pointed out through discussion questions. Finally, using a table, students were encouraged to evaluate the "value" of various ecosystems to humans in terms of productivity.

Pollution

For this unit, students attempted to use snow as an indicator of air pollution. A map of the school grounds was prepared, sampling points located, snow samples taken, filtration performed, particulates weighed and graphs of the results tabulated. From this information, students were supposed to see the usefulness of snow as a sampling medium, that airborne particulates are all around them and that their own school may be a source of air pollution.

Soil Organisms

In addition to gathering soil samples, students set up equipment to remove soil organisms from the samples. Based upon this investigation, students were supposed to better understand the adaptations organisms evolved for subsurface living conditions, the beneficial activities of these organisms for humans, and the coping mechanisms the animals use for winter survival.

Investigating Snow

While we were born with Curiosity
and Wonder
and our early years full
of the adventure
they bring, I know such inherent joys
are often lost.
I also know that, being deep within us,
their latent glow can be fanned to
flame again
by awareness and an open mind.

—Sigurd Olson
"Listening Point"

Students can investigate the impact of snow on animals, water, trees, and themselves through observations of habitats, testing predictions, and measuring. Students relate snow to pH, oxygen and temperature, volume, water content and the number of people it could support, and begin to communicate feelings, awareness, and values of snow.

These activities can be used in a rural, suburban, or urban environment, whichever is most accessible and familiar to the students.

OBSERVING SNOW

Task 1: As you walk to your destination, observe and record the influence of snow on plants, animals, air and water.

[illegible]

OBSERVING AND RECORDING ANIMAL HABITATS

[illegible]

Task 2: [illegible]

[illegible]

[illegible]

COMPUTING THE WATER CONTENT OF SNOW

Task 3: Compute the water content of snow, following the instructions for collecting and recording water equivalents of snow.

a. [illegible]

[illegible]

b. [illegible]

[illegible]

c. [illegible]

[illegible]

d. [illegible]

[illegible]

MEASURING AND RECORDING SNOW CHARACTERISTICS TO TEST PREDICTIONS

Task 4: [illegible]

Air temp. will be ___ degrees

Snow temp. at 1/3 depth ___ degrees

Snow temp. at 2/3 depth ___ degrees

Ground surface temp. ___ degrees

pH of the melted snow ___ [illegible]

The dissolved oxygen ___ [illegible]

[illegible]

NOTE: [illegible]

[illegible]

VERIFYING THE PREDICTIONS

[illegible]

NOTE: [illegible]

[illegible]

Task 5: [illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

[illegible]

Wildlife Management Overview:

A primer on the essentials of managing for wildlife

Wildlife management has been around almost as long as humans have. Early management techniques included tribal taboos and customs as well as a few laws. As Man learned more about the needs and benefits of wildlife, wildlife management matured as a science.

The concept of wildlife ownership has changed, too. Early in the history of Asia, all wildlife belonged to the Great Khan. In Europe, each landowner owned the game on his land (this is still true today in most cases). And then, a new concept of ownership developed in the United States, where wildlife belonged to all the people.

Public ownership of wildlife is a great democratic principle. But it carries with it a responsibility for every citizen to have knowledge of wildlife . . . to be wildlife literate. This is why wildlife management is an appropriate and important part of public education.

The following material is suitable for general upper elementary and secondary students. It is a general introduction to the science of wildlife management, emphasizing the need for wildlife habitat. It can be used as part of your science or social studies curriculum. And it deals with a subject that is just outside your classroom—northwest wildlife. Let it be the start of an exciting unit!

Introduction

Nearly everyone loves and enjoys wildlife. There are few joys greater than seeing a soaring eagle, a bounding deer, or a swimming beaver. A love of wildlife is good, but it is only of value when it is used to ensure that wildlife is correctly managed. After all, who wants the California condor to vanish or the western meadowlark's song to end.

Wildlife is important as a source of beauty, scientific (biological) knowledge, recreation, and income. Wildlife is sensitive to change and is valuable because it indicates the quality of its environment (weather, plants, and all other factors that affect an animal). Healthy wildlife populations indicate a good environment; few or no wildlife usually means something is wrong.

The study of wildlife leads to a deeper understanding and appreciation of wildlife. The only way to make sure that you—and other people—will be able to continue to enjoy and benefit from wildlife is to learn about management and how it works to maintain wildlife and its environment.

Wildlife Management Concepts

Wildlife management is the science of managing wildlife and its habitat, including man, for the benefit of the entire biota (all the plants and animals in an environment).

There are several important concepts basic to the wise management of wildlife:

- Wildlife management must be based on biological knowledge.
- The management of wildlife must include the management of man because man's activities affect wildlife.
- Management must be designed to benefit the entire biota, not just wildlife.
- Mangement means conservation (wise use), not preservation (nonuse).

Habitat

Habitat is an environment that supplies everything wildlife needs for life—food, cover, water, and space. When these habitat factors are in good supply, they contribute to the well-being of wildlife. If any of the habitat factors is in short supply, it limits the number and distribution of wildlife and is called a limiting factor.

Food. Each wildlife species eats specific foods, regardless of other foods that may be available. In addition, some plants have more nutritional value than others and this may vary according to the time of year. For this reason, both the quantity and the quality of the food are important.

Cover. Wildlife needs cover to protect it while feeding, sleeping, playing, breeding, roosting, nesting, and traveling. Cover can take many forms, such as vegetation, burrows, rocks, or other natural features.

Water. All wildlife needs water. Sources of water are surface water, dew, snow, and succulent (juicy) vegetation. Some animals can also use metabolic water (water produced by chemical processes in the body).

Space. Wildlife needs space if it is to survive. Overcrowding leads to severe competition for all the habitat factors essential to life. For this reason only a specific number of animals can live in an area.

Wildlife is often described as an edge species because it commonly lives along the edges—not in the center—of the different types of vegetation growing in an area. This tendency for wildlife to concentrate between two or more types of vegetation is called the edge effect. If there is a good arrangement of food, cover and water, it creates more edge area for wildlife to live in.

Carrying Capacity

Carrying capacity is the number of each wildlife species the habitat can support throughout the year without damage to either the animals or the habitat.

When wildlife numbers exceed the carrying capacity of the habitat, the excess animals die from starvation or other causes. When wildlife is overcrowded, it must compete for food, sometimes destroying the vegetation that serves as a source of food and cover. If habitat is damaged or destroyed, it decreases the carrying capacity of the area.

The only way to increase wildlife numbers in an area is to increase the carrying capacity. That can be done by improving existing habitat or by creating new habitat.

AFRICAN ELEPHANTS

Today in Africa, the plight of the elephant, the largest land mammal in the world, is the perfect subject for a case study of wildlife management needs and problems.

Between ivory hunters and growing human populations, the elephants of Africa are dwindling in number. They are being crowded into reserves that are too small to sustain their numbers.

In the old days, elephants could eat as much grass as they pleased. They would then move on to new areas, allowing the grass and trees to recover. Now, with only limited land, there is not enough time for the grass and trees to recover. There is a very real possibility that many elephants could starve to death in the very places established to assure their survival.

Population Dynamics

In wildlife management, it is important to understand the factors that affect the growth and decline of wildlife populations. This is called population dynamics.

A population is a group of animals of the same species that occupy a particular area. Dynamics refers to motion or change. Population dynamics, therefore, means the changes that occur in a population over time.

Two major factors affect the population dynamics of wildlife—the birth rate and the death rate.

Birth rate. Most wildlife species have a high birth rate. The smaller species of wildlife have higher birth rates than the larger species. The most important factors that affect the birth rate are:

- numbers of young per birth;
- number of births per year;
- age at which breeding begins.

Death rate. The death rate of most wildlife species is high. The smaller species of wildlife have higher death rates than the larger species. The most important factors affecting the death rate are:

- starvation (most important factor because it is directly related to habitat);
- hunting (used to remove some of the animals that would otherwise be lost to starvation or other causes);
- climate (severe weather can reduce wildlife numbers);
- predation (not important unless cover is limited); diseases and parasites (not important unless animals become unhealthy and starvation occurs).

If the birth rate is greater than the death rate, wildlife numbers increase. If the death rate is greater than the birth rate, wildlife numbers decrease. When the birth and death rates are equal, population numbers do not change.

Population growth and decline. Wildlife has a tremendous capacity for reproducing and increasing its numbers. But this growth cannot continue indefinitely. There is always some factor—usually food or cover—that becomes limiting.

Let's look at a situation that occurs each year in wildlife populations.

In the spring, the breeding stock (animals needed for breeding to replenish the population) begin having their young. The population reaches its peak in the summer. At that time, the population numbers have become greater than the carrying capacity of the habitat. The population then begins to decline because the habitat cannot support the excess animals. The decline continues through the spring of the following year. This cycle occurs every year. Although the peaks in population numbers may vary according to the birth and death rates, the shape of the curve is the same for all species of wildlife.

The wildlife manager's task is to control the numbers of animals at or below the carrying capacity so that no damage is done to the animals or their habitats.

Wildlife Management Tools

Management programs must be flexible since the wildlife populations and habitat factors may change from year to year. A good wildlife management program uses a combination of all the management tools available. Wildlife managers collect information on habitat and wildlife numbers throughout the year to determine the type of management program needed.

Laws

Man's first reaction to something he doesn't like is to pass a law against it. Wildlife laws are needed, but are worthless unless they are based on biological facts and used in combination with other management tools.

Sometimes, giving total protection to a wildlife species is a poor approach. Laws that give complete protection to a wildlife species are inflexible, preventing the use of any management tools that may be needed. If management is to be effective, it must be possible to change these laws each year to reflect changes in habitat conditions and wildlife populations.

Predator Control

A predator is an animal that lives by killing other animals for food. Long ago, predators were tagged as bad animals and bounties (money rewards) were offered to encourage their control. It was thought that control of predators would result in more wildlife. However, the bounty system was ineffective in controlling predators or increasing wildlife numbers.

The extent and effect of predation on a wildlife species depend on:

- the quantity, quality, and distribution of cover;
- abundance of the wildlife species;
- abundance of predators;
- other food available to predators. (Animals that are alternate food for predators are called buffers.)

Prey (animals killed for food) greatly outnumber and outproduce their predators. Nature creates excess prey so that both the prey and the predators can survive. For this reason, predation has little effect on wildlife populations that have excess animals.

Lack of cover is the biggest cause of excessive predation. When habitat is good, a healthy balance can exist between predators and prey.

Predator control is sometimes necessary to protect small or unhealthy wildlife populations until they can increase their numbers. Animals that prey on domestic sheep, cattle, and poultry also may require control measures.

Refuges

Refuges provide wildlife with suitable habitat for the purpose of increasing wildlife numbers. There are four general types of refuges: 1) big game, 2) small game, 3) waterfowl, and 4) nongame.

The goal of a big game refuge is to protect the breeding stock so the population can increase. But the refuge can defeat its own purpose. Deer and elk, for example, may increase in numbers to the point where they exhaust the available food supply. Damage to the habitat and to the animals then occurs.

Refuges for small game animals can lead to increases in wildlife numbers if the refuges provide adequate food and cover for year-round use. Such refuges should be small—seldom more than a few acres.

Of all the types of refuges, those for waterfowl are the most successful. A waterfowl refuge may be a breeding

[illegible]

[illegible]

area, a wintering area or a flyway refuge. Breeding areas provide nesting habitat for producing young. Wintering areas shelter the birds so they can survive until the next breeding season. Flyway refuges provide rest, food, and safety during long migration flights. Many refuges are established to attract waterfowl away from agricultural crops, thus reducing the amount of crop damage.

Nongame refuges are often established to protect the habitat of some wildlife, usually rare or endangered species. Some nongame species live in areas where habitat is limited. If this habitat were altered or destroyed, the species would probably not survive. Nongame refuges ensure that the habitat is maintained so the species will survive.

Wildlife refuges are effective only when correctly used in combination with other management tools.

Stocking

The purpose of stocking is to release wildlife into areas that have small or no wildlife populations. Stocking may be done by releasing artificially reared animals into the wild or by trapping wild animals from established populations and transplanting them into other areas.

Many of the early stocking programs did not consider the limitations of habitat. If man introduces wildlife beyond the carrying capacity of the habitat, the animals will disappear. Good habitat can support a large wildlife population; poor habitat only can support a small wildlife population.

Severe weather or other factors may decrease wildlife numbers in good habitat. But populations usually recover when conditions improve. If the habitat is in good condition, stocking is usually unnecessary, although there are times when it may be necessary.

Stocking may prove useful in some situations, such as releasing wildlife in areas where it does not occur naturally or where populations are extremely low. In such cases, wildlife managers carefully study and select areas before making releases, thus ensuring good wildlife survival.

Habitat Management

Habitat is the key to wildlife survival. But wildlife habitat is declining at an alarming rate in the United States. Much habitat has been lost to urbanization and other uses as the human population demands more living space, food production, and so on. Other wildlife habitat has been destroyed by drainage of marshes and needless burning and cutting. Without habitat, no wildlife can survive.

The main purpose of managing habitat is to prevent existing wildlife habitat that is in good condition from being destroyed or lost. Once existing habitat is well protected, habitat in poor condition can be improved or new habitat can be created.

Hunting and Trapping

Hunting and trapping are valuable management tools for helping maintain healthy wildlife populations at or below the carrying capacity of the habitat. When animals exceed the carrying capacity, the habitat may be damaged and the excess animals will die. Hunting and trapping are closely regulated so that some of the excess animals in a population are removed each year. Thus, hunting and trapping can be used to effectively manage many wildlife populations and protect their habitat from damage.

Public Education

Education is essential to gain public understanding and acceptance of wildlife management programs. When people know more about wildlife and its needs, they support management programs.

For example, some people are strongly opposed to all hunting. They mistakenly think that sport hunting is responsible for killing or seriously endangering some wildlife species. In reality, it is man's activities that have destroyed valuable wildlife habitat, resulting in the extinction of some wildlife species.

The Future of Wildlife

The future of wildlife depends on people. The way you act can determine whether wildlife lives or dies. For this reason, you should be aware of what you can do to ensure a brighter future for wildlife.

Knowledge

Understand the facts before you take a stand on issues relating to wildlife. If in doubt, get more information from your state fish and game department.

Habitat Management

Support programs to maintain or improve wildlife habitat. The following are a few of the things you can do to help provide wildlife habitat.

- Do not clear wild areas to make land appear tidy. Needless burning and cutting destroy wildlife habitat. If weeds are a serious problem, consider using cultivation or other control methods. If burning is unavoidable, burn after the spring breeding season.
- Protect wildlife areas from livestock. Fences prevent livestock damage to wildlife habitat.
- Plant food for wildlife. You can plant grains, fruit-bearing bushes, grasses, and legumes (plants that have pod-like fruit or seeds) along fence rows, ditch and row banks, field edges, or other unused land areas. A few outside rows of grain left standing near cover also provide food.
- Build brush piles or establish woody thickets to provide cover. Small tracts of land (field corners, power and telephone rights-of-way) are good spots for planting shrubs and trees. You can also pile up limbs from pruned or thinned trees to create cover.
- Create a pond or other wetland area. Willows and cattails make good wildlife habitat.

Management Organizations

Support your state fish and game department in its attempts to manage wildlife. If in doubt about a wildlife issue, ask the biologists for the facts.

Funding

Be willing to spend more money on wildlife resources. Support legislation that will ensure adequate funding -- from both hunters and nonhunters -- of game and nongame management programs.

Text material adapted from:

Principles of Wildlife Management. Animal Science Leaflet [illegible]. University of California, Division of Agricultural Sciences, Cooperative Extension, Berkeley, CA, [illegible].

Oregon Hunter Education Student Handbook. Outdoor Empire Publishing, Inc., Seattle, WA, [illegible].

RESOURCES FOR TEACHING ABOUT WILDLIFE MANAGEMENT

Project WILD -- a supplementary environmental education and conservation education program emphasizing the place and value of wildlife. WILD is designed to fit into curriculums currently in use in K-12 classrooms. WILD materials are available through workshops held by the Oregon Department of Fish and Wildlife ([illegible]), the Oregon Department of Education ([illegible]) or the Washington Department of Game ([illegible]).

Un-Endangered Species: The Success of Wildlife Management in North America -- [illegible] booklet featuring in-depth discussions of the success of wildlife management (also available in slides and videotape). Order from Literature Department, National Shooting Sports Foundation, 1075 Post Road, Riverside, CT 06878.

Oh My Deer! -- a new wildlife management simulation game that places players in a management role dealing with a herd of deer. This game is one of the best and deals well with carrying capacity, overcrowding, the role of hunting, environmental factors and man's intervention as well. Order from Carolina Biological Supply in Gladstone, OR [illegible] or call free 1-800-[illegible].

Wildlife Biology -- by Raymond F. Dasmann. An excellent, easy-reading textbook at a reasonable price. Published in 1981 by John Wiley and Sons, Inc.

The Class Project -- A hands-on junior and senior high supplementary curriculum guide. TCP contains a good mix of activities and information. Published by the National Wildlife Federation, 1412 16th St. N.W., Washington, D.C. 20036.

A Sand County Almanac -- by Aldo Leopold. The classic on conservation and nature. Published by Oxford University Press, New York. Available at any good bookstore.

The Let's Go Hunting Game -- A new simulation game in which players learn the legal requirements, safety aspects, and pitfalls to successful hunting. Developed in Oregon by The Let's Go Hunting Game, P.O. Box [illegible], Oregon City, OR [illegible]. Available in some retail outlets.

SPRING

the awakening earth

[illegible]

[illegible]

A Planning Guide for Education Decision-Makers

A checklist for evaluating
environmental education
in your school

[illegible]

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- [illegible]

[illegible]

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- [illegible]
- [illegible]

[illegible]

Instructional activities

[illegible]

The school system

[illegible]

Guidelines for development and use of environmental education materials, programs, activities

General considerations

[illegible]

Development of materials

[illegible]

Program implementation

[illegible]

Evaluation

[illegible]

Conclusion

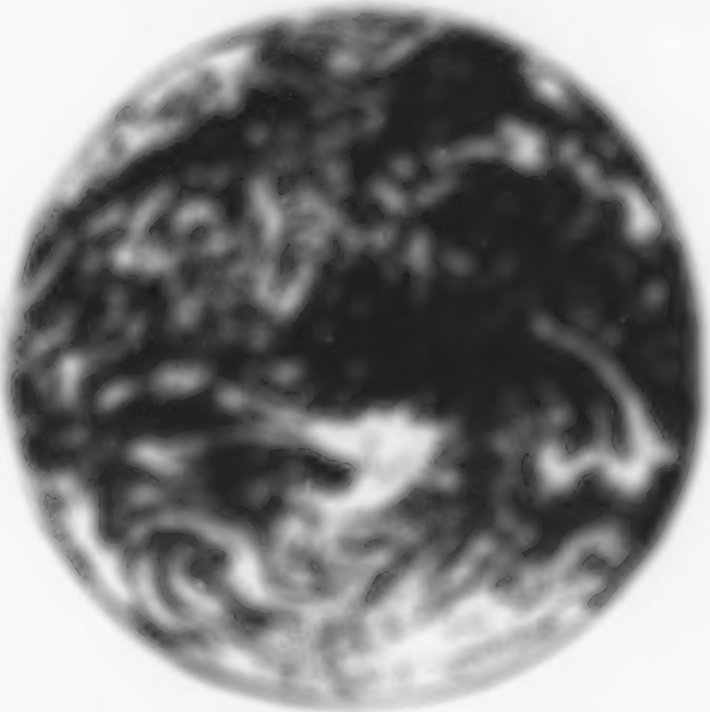
[illegible]

[illegible]

People and Environment:

Understanding Global Relationships

[illegible]



GLOBAL ENVIRONMENT ISSUES

[illegible]

[illegible]

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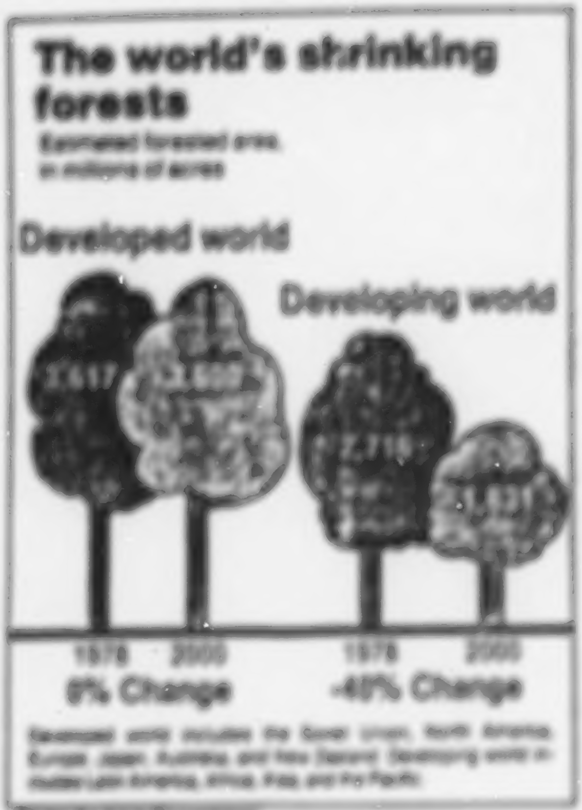
The world's shrinking forests

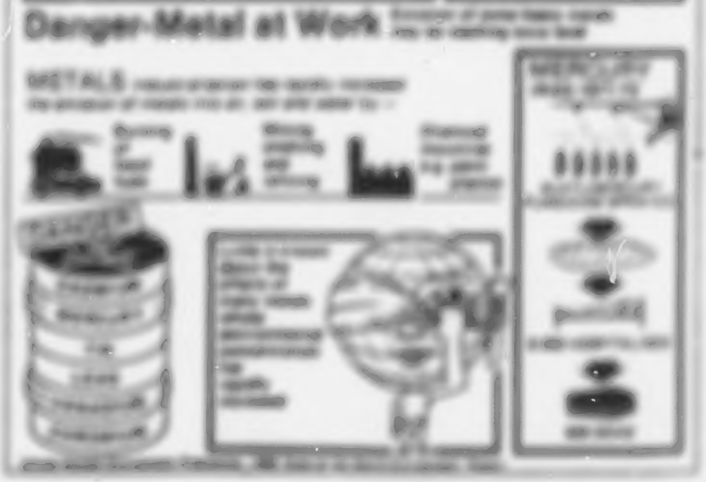


NORTH AMERICA
EUROPE
SOVIET UNION
ASIA
AFRICA
SOUTH AMERICA
AUSTRALIA
Atlantic Ocean
Indian Ocean
Pacific Ocean
Deserts

The Global Greenhouse

THE RISE OF CO2
INSIDE THE GREENHOUSE
HOW IT GETS THERE

Danger-Metal at Work



297
359
117
79
922

BEST COPY AVAILABLE

Human needs	[illegible]	[illegible]
Life	[illegible]	[illegible]
1 [illegible] 2 [illegible] 3 [illegible] 4 [illegible] 5 [illegible] 6 [illegible]	[illegible]	[illegible]
7 [illegible] 8 [illegible] 9 [illegible]	[illegible]	[illegible]
10 [illegible] 11 [illegible] 12 [illegible]	[illegible]	[illegible]
Ecology	[illegible]	[illegible]

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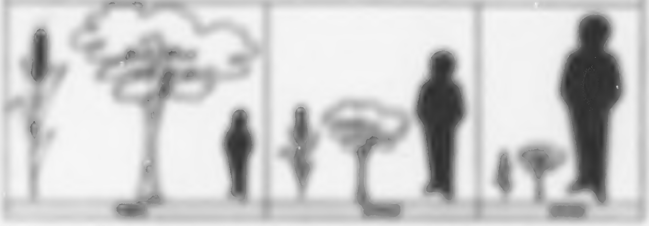
Why a world conservation strategy is needed

A world strategy for the conservation of Earth's living resources is needed now because



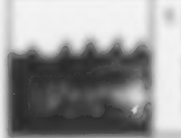
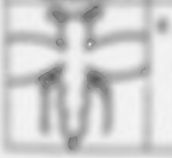
[illegible]

"Unlike our forebears who became extinct, we are an animal capable of almost limitless choice. The problem facing us today is our inability to recognize the fact that we are able to choose our future. It is my conviction that our future as a species is in our hands and ours only . . . . For me the search for our ancestors has provided a source of hope. We share our heritage and we share our future. With an unparalleled ability to choose our destiny, I know that global catastrophe at our own hands is not inevitable. The choice is ours."

Richard Leakey
Origins, 1977

"[illegible]"

[illegible]

Diseases Related to Poor Water Supply and Poor Sanitation		
	1. Water-borne Water which has been contaminated by poor sanitation causes disease	Diseases: Cholera, typhoid, infectious hepatitis Prevention: Improve sanitation and water quality
	2. Lack of Water Insufficient available water to allow people to wash regularly; infections develop	Diseases: Scabies, yaws, leprosy, trachoma Prevention: Provide more water, improve personal cleanliness
	3. Water-Based Disease-carrying organisms live in local water supply	Diseases: Schistosomiasis, guinea worm Prevention: Avoid infected water, protect source of clean water from infestation
	4. From Water-Related Insects Infection-carrying insects breed in stagnant water and bite near it	Diseases: Malaria, sleeping sickness, yellow fever Prevention: Provide piped water supply

[illegible]

World on the Move
ACCIDENTS
GOOD NEWS
CONGESTION
PIPELINES
OIL SPILLS

[illegible]

Population Projections for World, Major Regions, and Selected Countries

[illegible]

[illegible]

What Have Teachers Learned?

by Mark Terry

Due to poor communication and a tendency among educators to revive definitions above all else, many teachers, districts, conferences and authors persist in adding definitions of environmental education to an already overburdened professional literature. For those still looking for something like a definition, here is a very serviceable set of goals for environmental education worked out in the office of the Superintendent of Public Instruction for the State of Washington:

Students should be able to derive from their education:

1. an accurate and comprehensive grounding in how the environment works, including man's interactions with the environment;
2. experience in valuing environmental quality, including the aesthetics of both "untouched" and "man-made" environments;
3. experience in how personal choices and actions affect environmental quality, with the aim of identifying and improving the opportunities in their own future;
4. experience in methods of exercising community responsibility, including all aspects of citizen-government-business decision making.

While the best way to proceed is to publicize further and demonstrate what works, it is also worth paying attention to what does not work and what is downright counterproductive. The sheer quantity of environmental education programs and materials produced over the last ten years suggests that there must be some chaff. The following five danger signals may prove useful.

1. **Corporate Sponsorship.** It is hard for individuals to be objective, but it is much harder for corporations, which are so much clearer about what they wish to accomplish in (and with) the world. The beauty of those four-color classroom presentations with handy multi-media components at reasonable prices (if they cost at all) seduces many a busied and harassed teacher. In fact, there is no need to resist the temptation as long as the following protective measure is enforced: always plan time to study the sponsoring group itself, its goals and the manner in which the material it has so generously provided might further those goals. This way the classroom can safely be decorated with those inspirational posters, because the corporate logo will no longer be subliminal but will be highlighted as a subject of study itself. Corporate education packages are, after all, advertising, and should always be seen as such.

2. **Ecology as Basic Science.** Many teachers, curriculum supervisors and textbook authors now introduce ecology as the foundation science of the future, guaranteed to lift kids out of boredom and convert them into a youthful commitment to further science courses and a lifelong environmental ethic. Too often, the excitement quickly wears off and such courses send kids right back to boredom. Ecology as a beginning science course is awkward because it is not a beginning science. Efforts to make it so leave kids confused and ecology misunderstood. Ecology is a synthetic science built from biology, chemistry, physics and others. At least a basic course in biology, which contains some fundamental chemistry and physics, is necessary prior to a real study of ecology. Ecology then makes a fine science elective after study of the basics, drawing on all the natural sciences to form an exciting synthesis. But it is not the quick and easy solution to the need for environmental education that many still assume it to be.

3. **Cosmetic Activity Programs.** There is much good to be done, many wrongs to be righted. The difficulty lies in the assumption that picking up litter, or turning off lights, or running a paper drive takes care of environmental education. Each of these is a worthwhile activity to [illegible] as part of a much broader range of activities all designed to teach environmentally responsible behavior. But if presented as the school contribution to "the ecology," as it is so often incorrectly stated, then kids are right to smell a rat and we should worry about those who don't. None of these activities goes to the heart of the matter; each is cosmetic. These are good cosmetics, but should not be promoted as more. The real issues are the needless production of litter, the design and care of building lighting systems, the excessive use of paper and mismanagement of forests. Without accompanying activities and study focused on these issues, the cosmetics are counter-productive, implying that a new age is at hand when really the old one just [illegible] on ahead and we're doing a bit better picking up after it.

4. **Heart Throbs and Hand Wringing.** It is downright dangerous to throw at kids successful images of endangered species or third world starvation and depend on the pain to do the work. Firsthand experience of a tragedy or disaster sometimes moves a person to seek understanding and commitment; the Hollywood version seldom does. This is not at all to suggest that such problems should not be studied. They should indeed, but only in depth. A tear-jerk media-based approach to tragedy simply doesn't do it — in fact, it generally promotes an outward show of concern and an inward turning away which is much more lasting.

5. **Avoidance of Local Issues.** It is also downright dangerous to avoid, or forget, or remain ignorant of the issues directly affecting the local community. The best possible course on world ecological problems is counter-productive if unaccompanied by equivalent study of the local issues. We run the risk of teaching that it's best to worry about long-distance solutions to other people's problems, because no one knows about or can agree on the problems right outside the door. Damage is also done by the systematic avoidance of a true local hot potato. Yes, parents often have strongly held opinions on such issues. But [illegible] the issue as an opportunity to practice the vital arts of dialogue and compromise.

Reprinted by permission of the author from *The New Environmental Handbook*, edited by Garrett De Bell, published by Friends of the Earth, 1990.

"Call Me Another Thrower . . ."

by [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

After the presentation, I sat in my office calculating the equivalents of crabs and starfish to 9,000 campers. I also tried to guess how many of the Board members had provided crabs or disenfranchised sea stars to their younger ones at camp.

"Somewhere far up the coast wanders the star thrower beneath a rainbow. Somewhere, there is a hurler of stars, and he walks, because he chooses, perhaps in desolation, but not in defeat."

Eight months later, I sat in front of the Camp Committee again, among them, doctors, lawyers, and entrepreneurs in various industries from fuel to pharmaceuticals. Would they support a Marine Interpretive Program? Surely they understood! Men of dispersal. Men of means and wisdom. It is well within their sphere of power. They spend a million dollars for a kitchen, a dining hall, a lodge, sewer systems and a dock. Is it in their nature? Surely they know its importance! Shall I explain the need or the importance of a marine program center and the disenfranchised sea star? Over 9,000 persons will walk those beaches each year.

"We walk alone and small in the immensity, hurl back the living stars [illegible] and sometimes the lone starfish reaches only once to a single child or a grown-up past hope [illegible] the task is not assumed lightly, for it is men as well as starfish we seek to save."

(Quotations taken from the essay "The Star Thrower" by Loren Eiseley.)

Activity

CREATE YOUR OWN TREE
(An art project for Arbor Day)

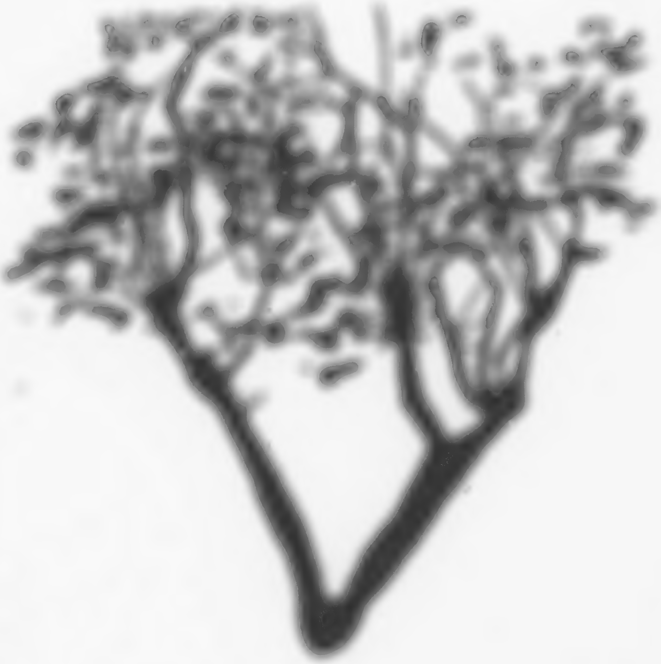
Place a drop of ink on a piece of paper.

Blow the ink with a straw (in one direction) to create a tree-like pattern. Students can practice making a variety of tree shapes.

Allow the tree to dry for a few minutes.

Mix up several colors (orange, yellow, green, blue, or red) of dry tempera paint.

Gently "dab" with a brush or with a sponge in blotting motion onto tree.



Summer

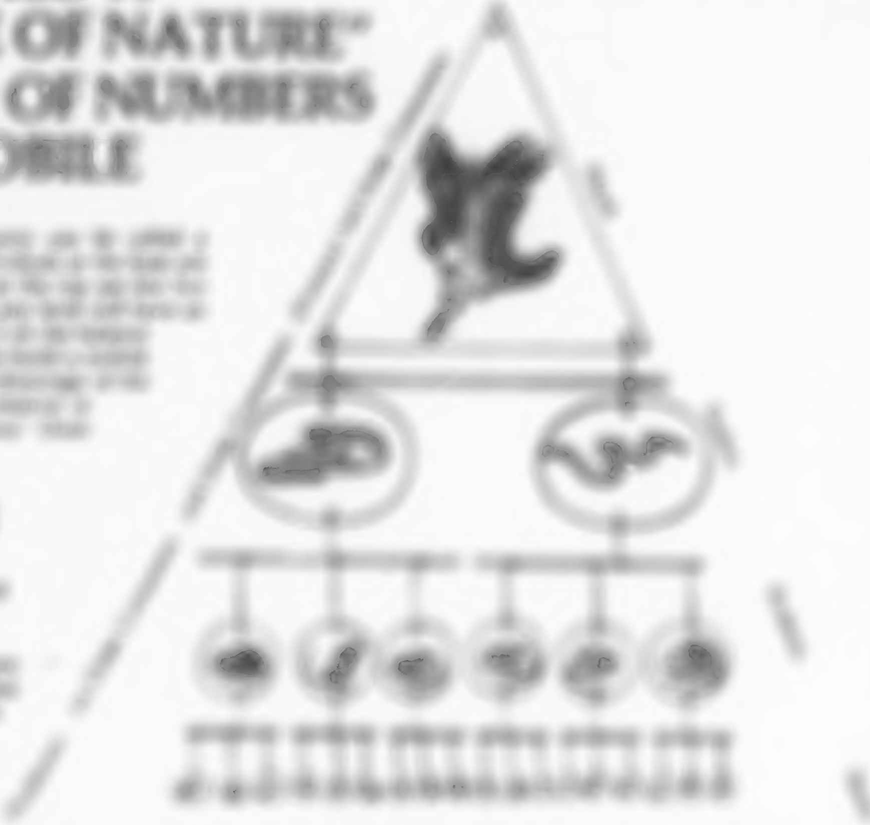
Searching for a Hidden Treasure

by Michael [illegible]

[illegible]

[illegible]

BUILD A "BALANCE OF NATURE" PYRAMID OF NUMBERS MOBILE



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YOU NEED:

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THE STEPS ARE:

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2. [illegible]

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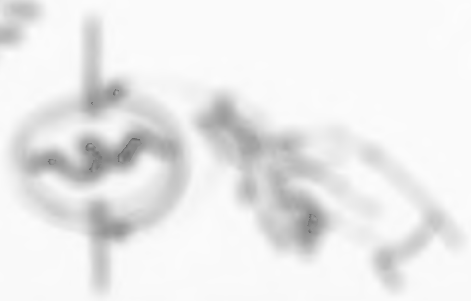

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NEXT:

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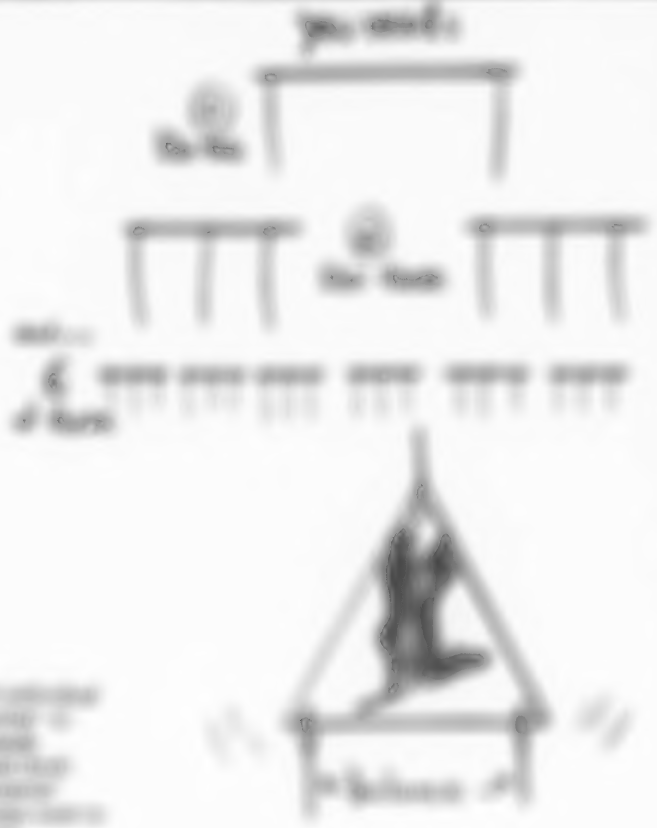

- [illegible]

CONGRATULATIONS!

[illegible]

[illegible] [illegible] **Balance of Nature?**

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A Solar Cooker

[illegible]

[illegible]

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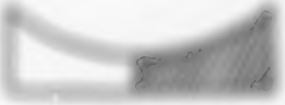

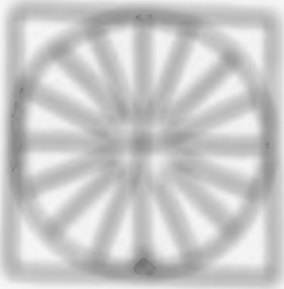

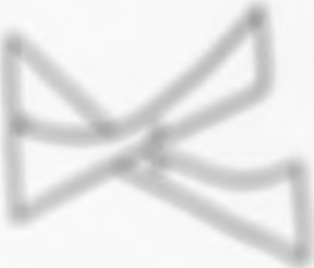

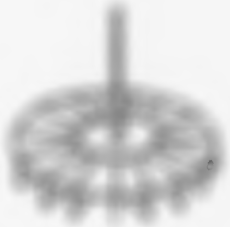

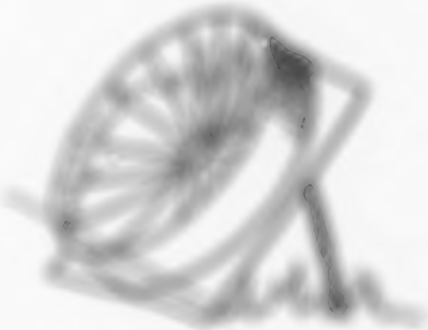

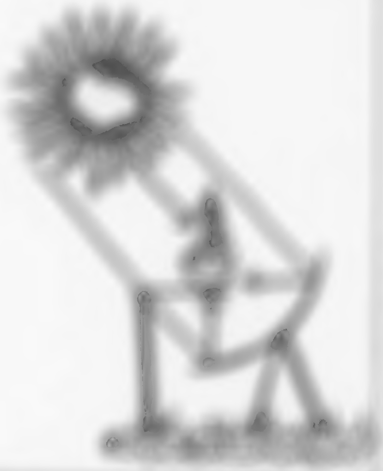

A Solar Cooker

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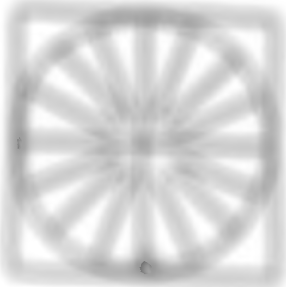

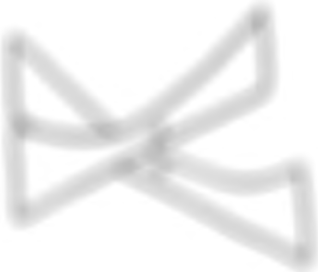

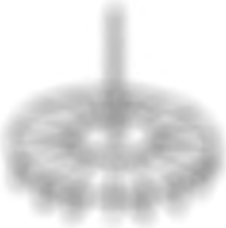

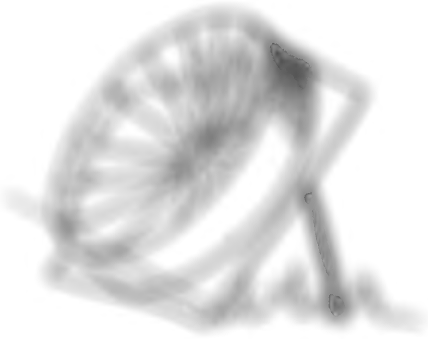

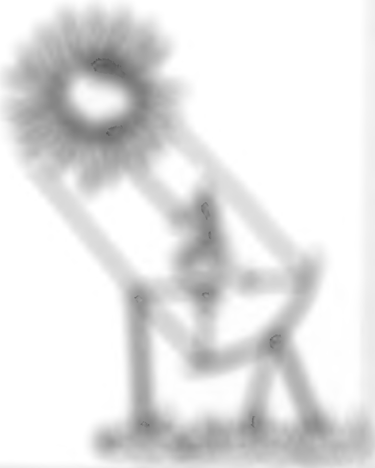

Solar Clockwork

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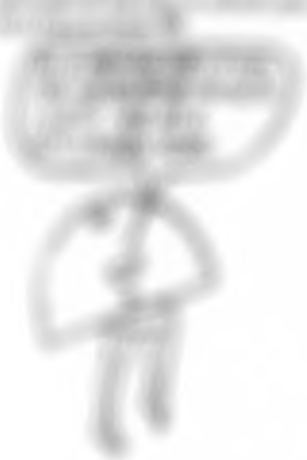

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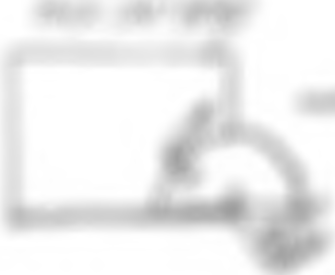

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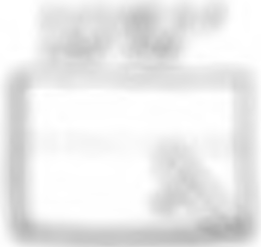

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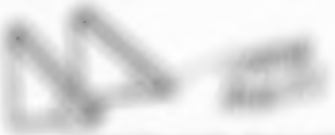

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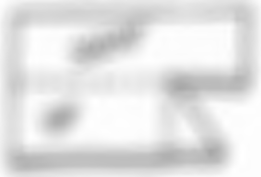

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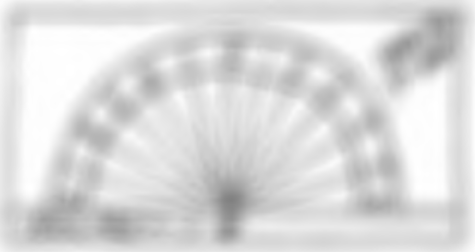

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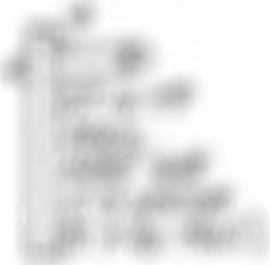

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Children in the Woods

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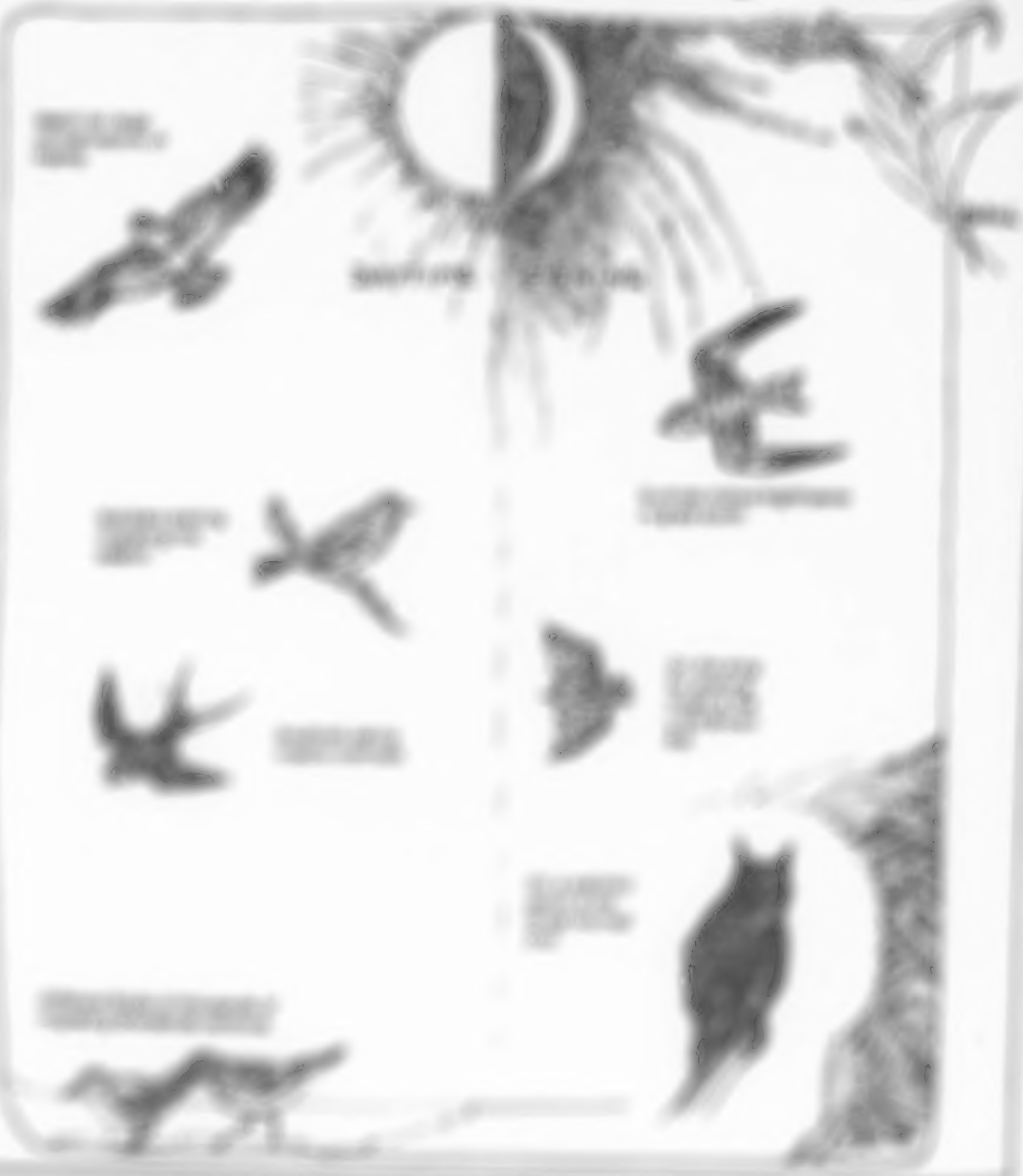
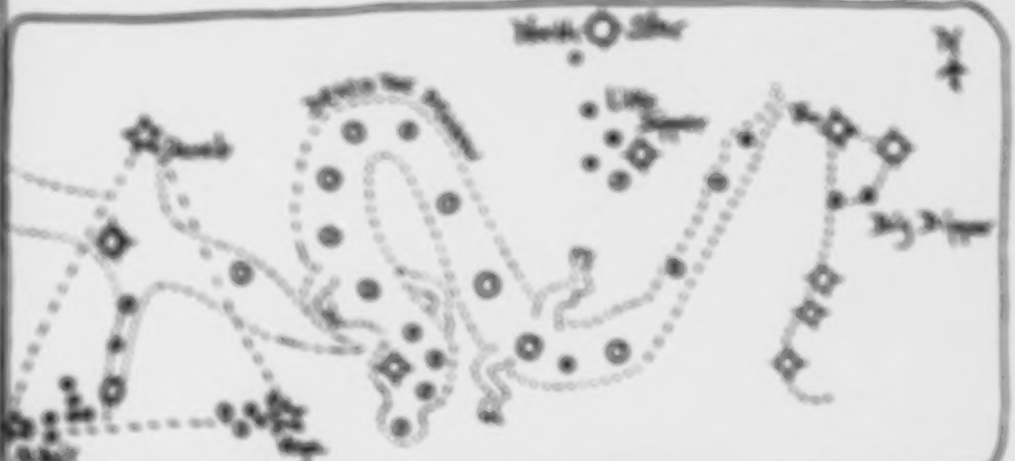
THE DOG DAYS

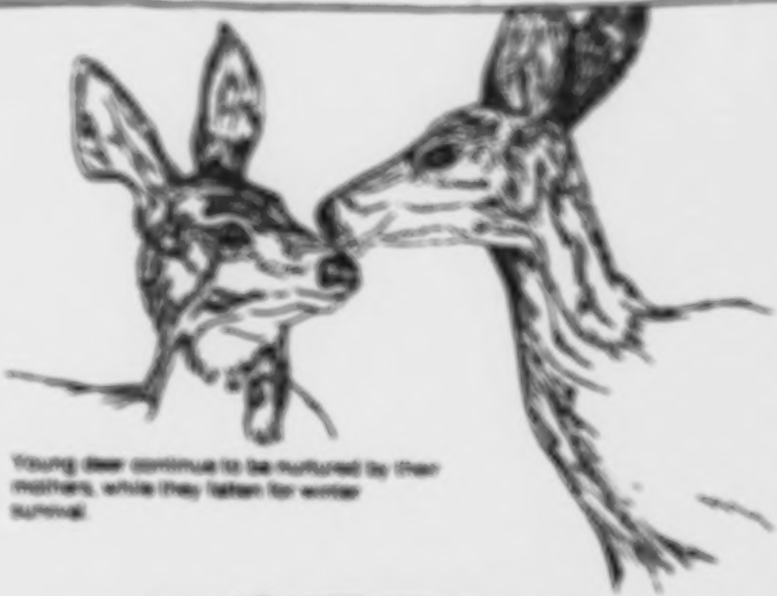


OF SUMMER

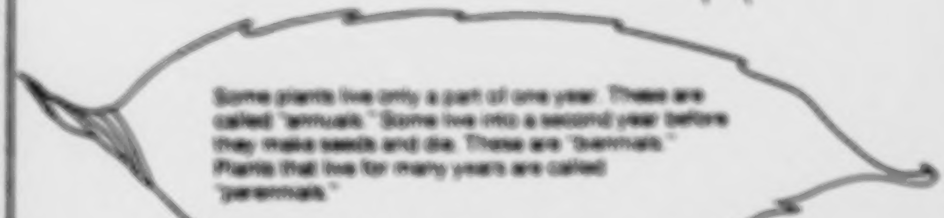
THE HARVEST MOON
The moon nearest the Autumn Equinox (September 22) is the Harvest Moon, because the full moon rising at sunset gives farmers extra hours of light by which to harvest.



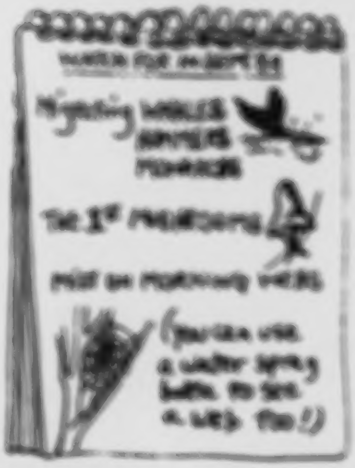
THE CONSTELLATIONS
The last easy days of summer, the Dog Days, were named after the Dog star Sirius, by the Egyptians, who believed the rays of the star combined with the sun to create the heat of summer. The loud energetic nights are in sharp contrast to the days, and late nights may be chilly. Look for Mars, Jupiter, and the moon on the last few days of Sept. as all the planets but Mercury will be in the western half of the sky this month. Day and night are of equal duration on Sept. 23 (at mid-latitude).



Young deer continue to be nurtured by their mothers, while they fatten for winter survival.



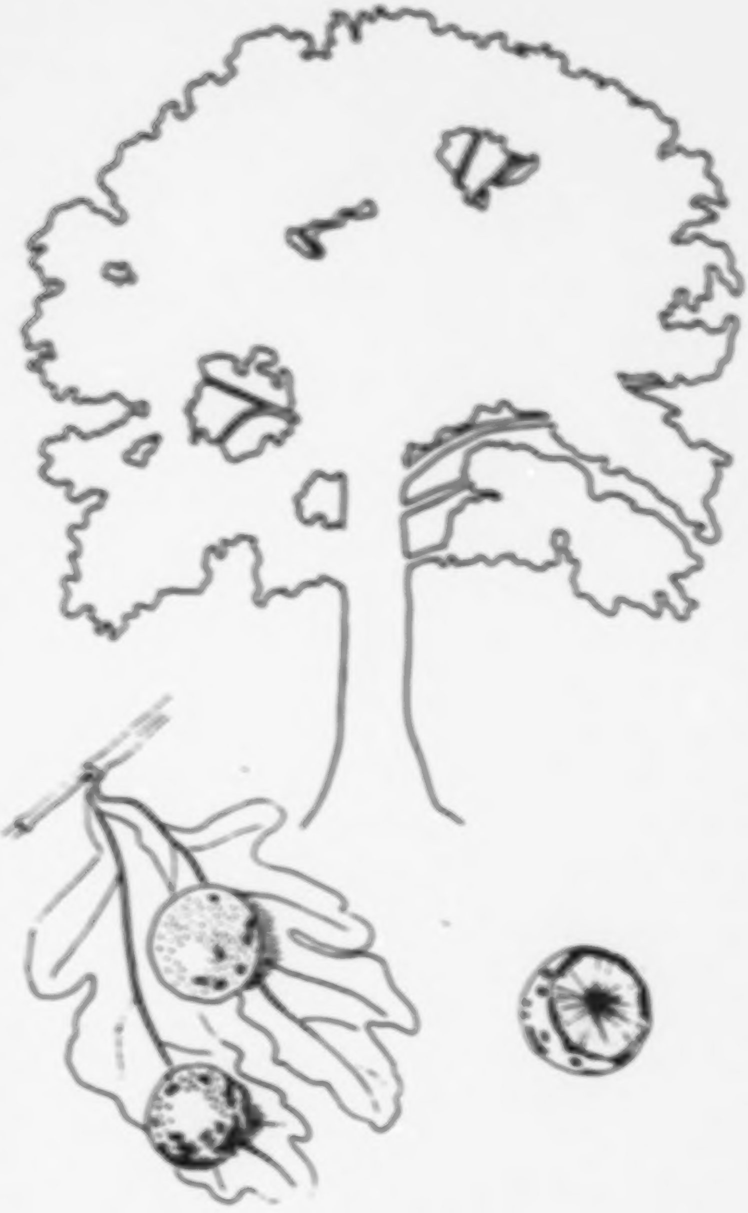
Some plants live only a part of one year. These are called "annuals." Some live into a second year before they make seeds and die. These are "biennials." Plants that live for many years are called "perennials."



The Curious Naturalist, Sierra Club Calendar, and me —

Activity

Investigating Oak Galls



This fall, when Oak trees throw their leaves in preparation for another winter, a curious plant-insect relationship will become more visible and will provide teachers an opportunity to explore with their students an example of a parasite-host relationship in the natural world.

A gall is an abnormal plant growth caused by the larvae of developing insects. In the Pacific Northwest, wasps lay eggs in spring that hatch into worm-like larvae. These larvae then alter the genetic blueprint of the host plant through hormones, causing what would have been normal leaves and stems to become a cancerous proliferation of cells called a gall. Within this gall, the developing larvae gains protein, carbohydrates, and protection from the elements as it develops into a full-grown adult wasp.

You and your students can have a fascinating look at this plant-insect relationship with relatively little preparation or extra materials.

Oak trees are the most common host plant for galls. Most schools either have or are near some oak trees that students can explore and collect galls from for examination. Other plants that often contain galls are members of the willow and rose families.

An initial activity for students might be to learn about and be able to identify the different kinds of galls. (See *Common Insects and Mite Galls of the Pacific Northwest* by Larew and Capizzi for help in this.) They can then explore a field of oak or other likely plants, tagging the galls they find by tying strips of bright cloth on the branch. This can help them learn to look closely at plants and see things they might otherwise miss.

Have student collect a variety of galls. After you have brought them back to the classroom, there are a number of things you can do:

- place the galls in a jar simulating their natural environment (with dirt, leaves, and occasional water) and watch them emerge.
- cut them open and examine the larvae within the gall. (There might also be other parasites besides the wasp larvae to be found!)
- make a list of the different types of galls the students found. Have them draw the different types and give them descriptive names.
- discuss other parasite-host relationships in the natural world.

SUN PRINTS

Sun prints are photographs made without camera or darkroom. These prints provide outdoor groups with an interesting method of recording evidence of plants and animals in their natural environment.

MATERIALS

For the group (developing materials):

2 or 3 wide-mouthed, gallon jars of plastic or glass with tops
3-4 cups of gravel or sand
1 grocery bag for each one-gallon container
1 pint of household, non-sudsy ammonia

For each individual or team:

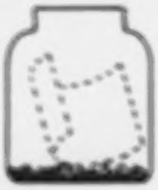
- ozalid paper* in lightproof envelopes (15 cm x 20 cm is a good size)

1 plate of glass or piece of plastic food wrap

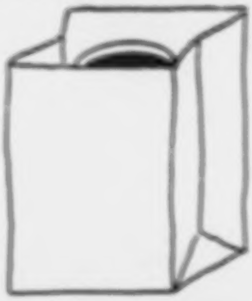
*Available from the Lawrence Hall of Science. See the "Equipment Order Form" in the OBIS Toolbox folio.

HOW TO MAKE A SUN PRINT

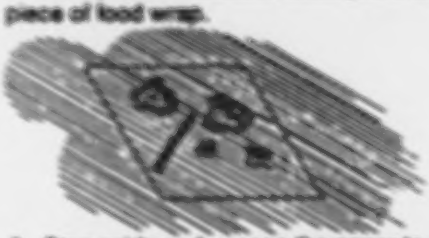
1. Pour enough household ammonia into each one-gallon jar to cover the bottom of the jar.
2. Pour two cups of sand or gravel into the jar and mix it with the ammonia. There should be enough gravel to prevent the ozalid paper from touching the ammonia.



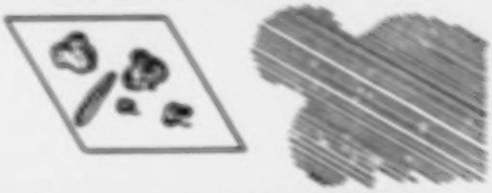
3. Set the jar in a grocery bag to prevent strong light from penetrating the jar.



4. In the shade of your body, remove one sheet of ozalid paper and arrange organisms and objects on the paper. Covering the objects with a clear plate or plastic food wrap will hold the objects flat against the ozalid paper. If objects are wet, place them on top of a glass plate or piece of food wrap.



5. Step aside and expose the paper to direct sunlight for fifteen to thirty seconds.



6. Pick up the paper and quickly put it into the jar. Put the cover on the jar and allow the paper to develop until the image appears (about one minute).
7. If the ozalid prints take too long to develop, or appear too weak, shake up the gravel in the jar to reactivate the fumes. If this doesn't help, add more ammonia.

Environmental Education:

Mission Gone Astray

by Steve Van Matre

(Excerpts from a speech by Steve Van Matre, Chairman of The Institute for Earth Education, a professor of environmental education and interpretation at George Williams College, and the author of Acclimatization, Acclimatizing, Sunship Earth *and* The Earth Speaks. *Steve presents this speech and others at centers and conferences around the world.)*

Have you ever noticed that the simplest things in life are often the hardest to say? Things like—"I love you," "I believe," "Yes," "I'm sorry" . . . Well, I have a problem like that. I'm working on a new book called *Earth Education: A New Beginning*, and to be honest, I'm having a lot of trouble with my opening line. How do you say you're sorry, and sound like you mean it, in advance? How do you apologize to those your words may offend even before you say them? How do you adequately explain that you are not attacking the people, but challenging the state of our field?

You see, we think Environmental Education has gone astray—not because we lack money or facilities or volunteers—but because we've lost a clear sense of our direction and our mission. And my fear is that any criticisms will sound like we're belittling everything and everyone, or come across like we have all the answers. We're not, and we don't . . .

However, poke your head into most any school today and see how much real environmental education you find going on there. I don't mean a couple of activities (inside or out) led by one or two valiant teachers, I mean *focused, sequential* instructional programs as a regular, integral part of the whole curriculum. Not much luck? Try the teachers' closets. That's where you'll probably find the most evidence. Look for the now unused books, boxes, pouches and kits that were once common to our field, plus the obligatory mimeographed curriculum guide. Chances are good that most of it gets very little use these days.

And if a few teachers do include an environmental lesson or unit, chances are good that they do not systematically address what environmental education set out in the beginning to accomplish, *i.e.*, how life functions ecologically, what that means for people in their own lives, and what they are going to have to do to change their lifestyles in order to lessen their impact upon the earth.

Next, stop by your average nature center or outdoor school and see what you find there as well. The name of the place may have changed, but they're probably back to identifying the plants, doing tombstone rubbings, taking Ph tests, reading the weather gauges, making maple syrup, etc. In other words, they're probably offering a loose assemblage of outside activities (yes, with some sensory awareness experiences from Acclimatization and a few similar environmental games thrown in) all tied together by a schedule rather than a desire to achieve particular learning outcomes.

After you've made the rounds of our educational institutions, sit down and sift through some of the major so-called environmental education programs that were developed. You're in for a surprise. You'll find that several of them didn't even deal with basic ecological understandings, i.e., concepts like energy flow or cycling or diversity. You're asking, "how could someone possibly claim to have a comprehensive environmental education program and not deal directly and effectively with the fundamental base for all life on the planet—the flow of sunlight energy?" That's a good question. What's amazing is that its been so seldom asked.

Other projects, as you'll see, dealt with some of the concepts, but never attempted to clarify for their participants how their lives were connected to those concepts, nor suggested that they should examine their lifestyles in light of their new understandings. A couple of projects included a framework, even placed ecological understanding within it, but then provided only a disjointed, random accumulation of not very stimulating activities to get the job done that they had so carefully identified in their organizational structure. As a result, you often got either the activities with no good framework, or the framework with no good activities.

It's also going to be pretty obvious in your examination that for some of these projects their activities were created first and their objectives formulated later. In fact, chances are good that any time you find an activity description that claims to accomplish several objectives simultaneously, then you've found an activity that was not developed with a specific learning outcome in mind. Instead, someone probably got a group together to come up with things to do, then figured out what their products were really going to acheive afterwards.

You should also check out how they placed such activities in various subject areas while you're at it. It probably went something like this: imagine for a moment people sitting around a table commenting upon an activity like making maple syrup. "Well, let's see, they figured out the number of buckets of sap it takes to make a jar of syrup didn't they, so it's a math activity." "OK. And they listened to the sap gurgling beneath the bark, that means it's a science activity." "Don't forget when we told them how the pioneers did it. That's social studies." "True, and they had to write a report on it when they got back, so it fits in language arts as well." Want to guess how some one would justify this as an environmental education activity to begin with? "Well, we discussed multiple forest roles with the kids while they watched the sap boiling down." R-i-g-h-t . . .

Perhaps the most damaging developement though was the assertion you'll find in many of these projects that leaders should use the materials in any way they like. In other words, people should just pick and choose whatever caught their fancy, or whatever happended to fit with what they were doing at the time. Hardly anyone said, "Hey folks, if you're going to be serious about the task of environmental education, then it won't work just to sprinkle a couple of activities around like so much spice. You're going to have to put together some focused, sequential programs to get the job done. Just bagging up a batch of activities and calling them a program is like tape recording a batch of sounds and calling them a symphony . . ."

In the end, I think we're going to have to face up to it: a lot of otherwise well-meaning people have been misled about the nature and purpose of environmental education. And as a result its become everything to everyone, and not much of anything to anyone. One of my favorite definitions that appeared in the early days was the one that goes "environmental education is education that is in, about, or for the environment." Gosh, no wonder people got confused. Under that definition, what isn't environmental education? And if any of these perplexed folks went off to a national conference looking for some answers, they would probably find everything from orienteering to acid rain on the program. Or in other words, everything from outdoor recreation to environmental studies. It's no wonder that the idea of developing focused, comprehensive education programs seemed to get lost in all of this jumbled potpourri of goals and offerings.

Here's the bottom line: we don't need collections of supplemental curriculum activities. They won't get the job done. We need specific, comprehensive units of instruction for specific settings and situations. Let's develop these focused programs and then go out there and sell them to the boards of education, youth groups, nature centers, adult organizations, park districts, etc. Anything short of this will only further the educational hypocrisy that already exists.

Please don't misunderstand: we don't think our way is the only way to get there, but we do think knowing where we're going and paying attention to how people learn is a big advantage. Nor do we think that everyone should be doing earth education all of the time, but we do think its influence on everything else is inescapable. Finally, we don't mean to belittle everything thats been done in the past, but we do think that many of those in pursuit of E.E. have lost their way.

Again, I apologize for how negative all this sounds, but I think it was Einstein who said, "If you don't know there's a problem, you don't have anything to think about." Believe me, there's a problem. Won't you join us in thinking about it.

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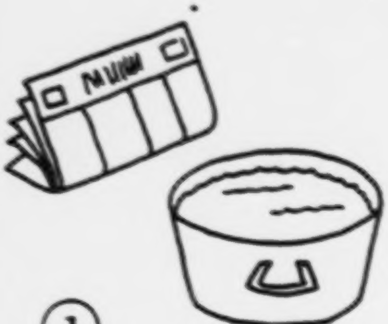
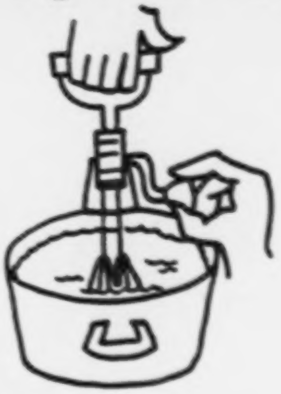
Paper Making Instruction Sheet
Recycle Recipe for Gray Paper



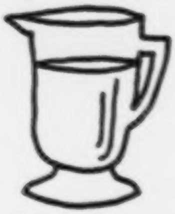
①

Tear newspaper in strips. Soak in tub.

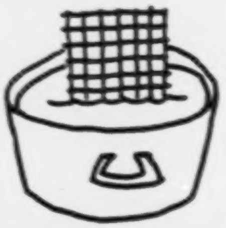


②

Add 1 T. instant starch for each 2 cups water for sizing.

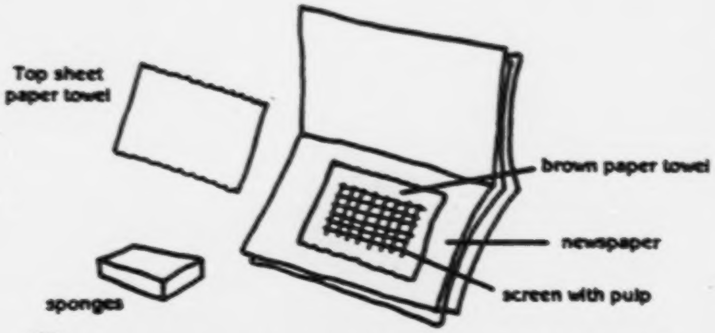


Beat well until mixed: this will be pulp.



③

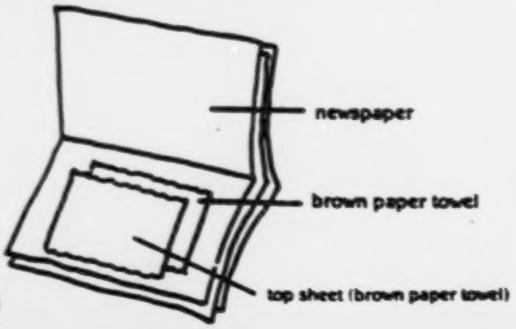
Mix 4-6 cups pulp in pan with lots of water.
Slide 6" x 6" screen into pulp.
Raise *slowly* so that very little water moves.
Hold over pan to drain.


Top sheet paper towel
brown paper towel
newspaper
screen with pulp
sponges

④ Lay paper towel on one side of newspaper scetion. Flop screen with pulp over onto paper towel.

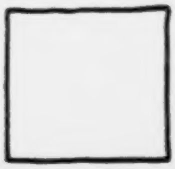
Press sponge down on top of screen and pulp to remove water.

Remove Screen. Place another paper towel over pulp. Close section of newspaper to act as blotter. Press down with hand.


newspaper
brown paper towel
top sheet (brown paper towel)

⑤

Open newspaper. Iron paper towel, pulp, paper towel sandwich with a medium temperature. Turn sandwich. Iron dry. Remove paper towel gently.



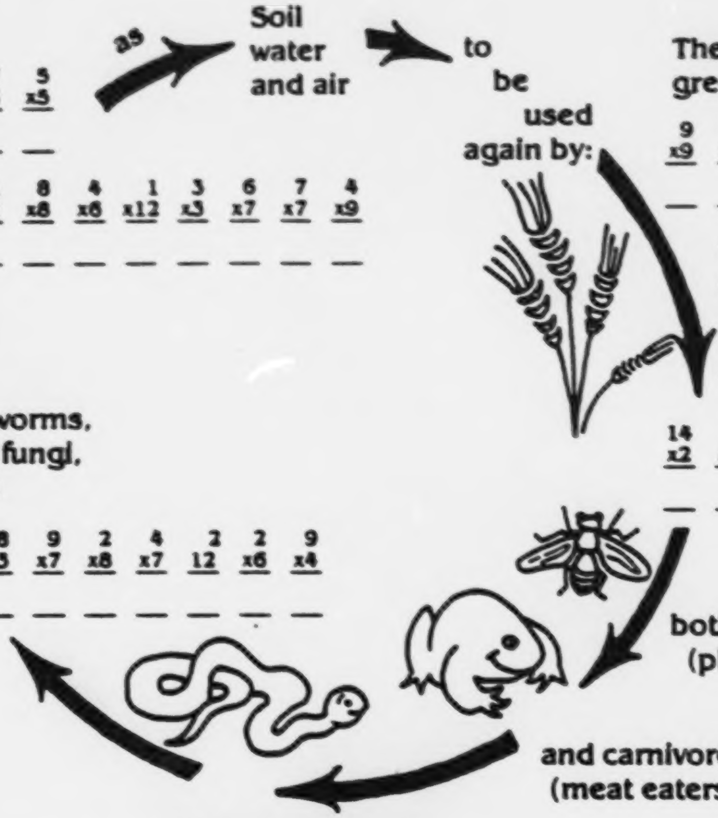
Recycled Paper

Activity

The Food Chain Story

Objective: Give examples of food chains.

Directions: Use the chart (code) at the bottom of the page to substitute letters for numbers in the answers to the math problems. Study the chart when the math is completed. Now do the next page.



The food chain begins with green plants called:

9	6	7	7	7	7	3	6	18
x9	x2	x8	x9	x2	x4	x8	x2	x2
___	___	___	___	___	___	___	___	___

which use the sun's energy to make food.

The plants are eaten by:

14	8	6	4	4	9	6	4	6
x2	x7	x8	x9	x4	x8	x4	x3	x6
___	___	___	___	___	___	___	___	___

both herbivores (plant eaters)

and carnivores (meat eaters)

whose bodies and wastes are exchanged by:

12	8	9	2	4	2	2	9
x1	x3	x7	x8	x7	12	x6	x4
___	___	___	___	___	___	___	___

Such as worms, bacteria, fungi, or molds

into

3	7	5
x4	x6	x5
___	___	___

8	21	8	4	1	3	6	7	4
x9	x2	x8	x6	x12	x3	x7	x7	x9
___	___	___	___	___	___	___	___	___

as

Soil water and air

to be used again by:

CODE:

A = 42	E = 24	M = 72	P = 81	T = 64
C = 28	I = 9	M = 48	R = 12	U = 16
D = 63	L = 49	O = 56	S = 36	W = 25

Autumn

by Michael Soule

Autumn, like each season, has its special gifts and treasures, which this year seem hidden from view. Mostly because I am still looking for summer to come out of hiding and surprise us all. Yesterday, strolling on our forest road, my eyes just happened to be present at one of the grandest autumn events, the breaking loose of a leaf from a twig, and the beginning of its descent dance. Catching this moment usually requires either a tremendous amount of concentration and patience, or a certain amount of blessing. It was a surprise for me. The faintest brush of wind on my cheek broke a leaf free and sent it tumbling, turning, floating, sailing, dancing down. The falling became a kind of gentle poem—describing better than words could hope to—the spirit of this day. It wasn't just the mottled, eaten, curled leaf breaking free that seemed the most dramatic, but more how much I found myself wishing it wasn't happening. In the briefest moment watching the leaf turn gently and touch down, all my left over summer hopes seemed to die. It can't be . . . It's just a fluke . . . I hope it's not so . . . I'm sure it's a mistake... Maybe it's true . . . I guess there's nothing I can do . . . It's really quite beautiful.

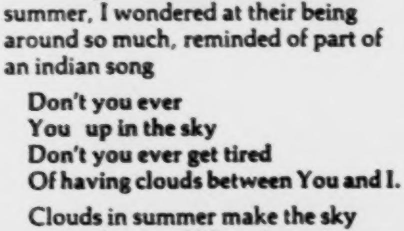
At that moment I awoke, realizing I had been so immersed in my unfulfilled hope for summer that I had been asleep to the beauty, the wonder of summer's transformation into autumn.

Clouds ruled the sky this morning. But their presence is not so unwelcome as in the summer days. Today they are like living sculptures, creating patterns where my mind can wander. In summer, I wondered at their being around so much, reminded of part of an indian song

Don't you ever
You up in the sky
Don't you ever get tired
Of having clouds between You and I.

Clouds in summer make the sky seem too low, and I keep bumping my head on them, like in the indian story "Ya-Hoh." And like the indians who worked together and pushed the sky up, I've had my summer day dreams about making a stick long enough to poke a hole in the clouds and let the sun peek through.

But in autumn, I am contented to watch and celebrate the clouds, and let their shapes stir my imagination. What forces are at play that shape a cloud into an image of a shining castle or a horse with wings or a picture of children running? I do not know. Is it possible that each cloud is a primitive kind of picture story being told to us? Or could it be that the clouds are a playground for the inhabitants of unseen realms?



So many ways to look at clouds and in the looking I become more aware of how many different perspectives there are about nature, and how much more life there seems to be,in the natural world through seeing it in different ways. This, I believe, lies at the root of what we hope to give our children, many different ways of seeing, ways of looking beyond the outer forms to glimpse at their essence. So many of the major issues in our culture today stem from those places where we have learned to see things only one way.

So, clouds seem like a wonderful place to start looking at nature in different ways, for they may look like elephants, or sailing ships, or funny faces. But beneath it all, they are always just clouds.

I walked to the bluff this afternoon and noticed the tall grasses beginning to bow, the life force from summer beginning to drain out of them. They were, in a way, surrendering to the new season, and bowing in thanks for the one past. I stood for awhile in them and then, I too, took a moment to bow, finally letting go of summer, welcoming autumn and giving thanks to the wind and the leaves and the clouds for what they have taught me today.

Ecosystem Word Puzzle

Activity

Objective: Define an Ecosystem.

WHAT DO PLASTIC ANIMALS AND PLANTS CALL THEIR WORLD?

1. ___ ___ ○ ___ ___ ___
2. ___ ___ ___ ___ ___ ○ ___ ___ ___
3. ○ ___ ___ ___ ___ ___
4. ___ ___ ○ ___ ___ ___ ___ ___ ___ ___
5. ___ ○ ___ ___ ___ ___ ___ ___
6. ___ ___ ___ ___ ___ ___ ___ ○ ___
7. ___ ___ ___ ___ ___ ○ ___ ___ ___ ___ ___
8. ___ ___ ___ ___ ___ ___ ○ ___ ___
9. ___ ___ ○ ___ ___ ___ ___ ___ ___ ___ ___ ___
10. ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ○ ___
11. ___ ○ ___
12. ___ ___ ___ ___ ___ ___ ___ ○ ___ ___ ___

CLUES

1. The sun sends this to us every day.
2. Members of a food chain that make food.
3. Plants give this off during photosynthesis.
4. Rain is an important part of this process.
5. Organisms that break down materials in a food chain.
6. Members of a food chain that depend on producers for food.
7. A long word that means "breathing."
8. A group of organisms made up of producers, consumers, and reducers.
9. Plants take this in and give off oxygen.
10. The process plants use to make food.
11. The place where nearly all our energy comes from.
12. Everything that surrounds us is a part of this.

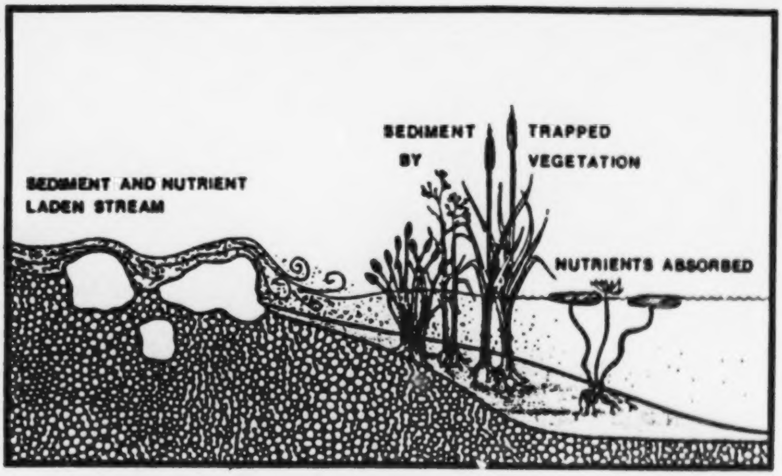
WORD LIST:

REDUCERS
FOOD CHAIN
ENERGY
SUN

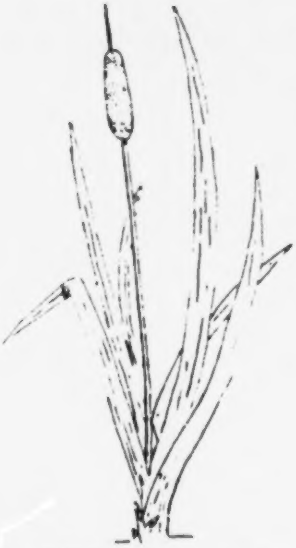
WATER CYCLE
CARBON DIOXIDE
ENVIRONMENT
CONSUMERS

OXYGEN
PHOTOSYNTHESIS
PRODUCERS
RESPIRATION

The Ecology of Wetlands

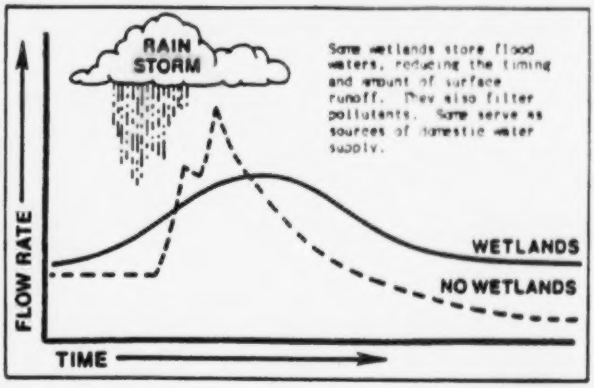

SEDIMENT AND NUTRIENT LADEN STREAM
SEDIMENT BY
TRAPPED VEGETATION
NUTRIENTS ABSORBED

Wetlands protect water bodies from sediments, nutrients, and other natural and man-made pollutants.



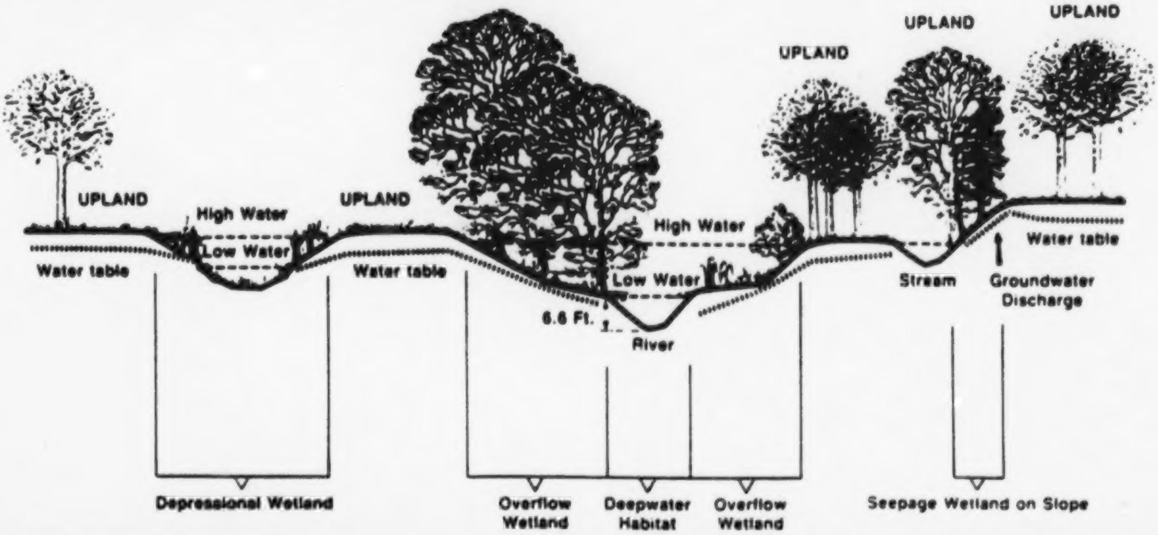
NARROW-LEAVED CATTAIL

Wetland vegetation, with massive root and rhizome systems, bind and protect soil. Vegetation also acts as wave barriers.



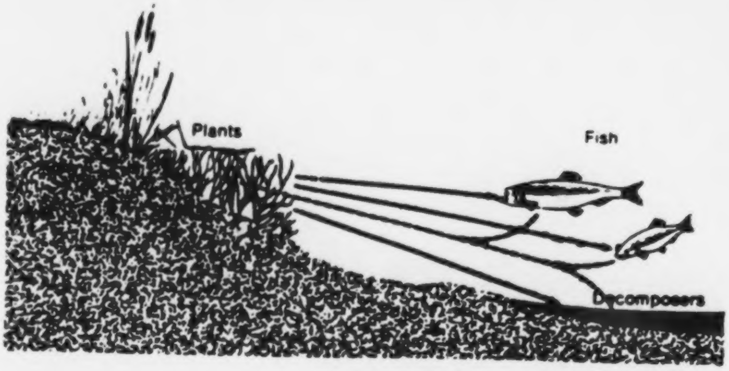
Some wetlands store flood waters, reducing the timing and amount of surface runoff. They also filter pollutants. Some serve as sources of domestic water supply.

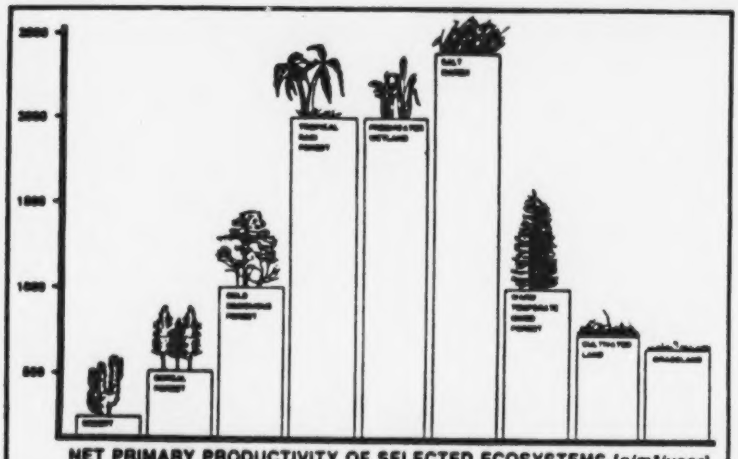
Both coastal and inland wetlands provide essential breeding, nesting, feeding and predator escape habitats for many forms of waterfowl, mammals and reptiles.


UPLAND
High Water
Low Water
Water table
UPLAND
Water table
UPLAND
High Water
Low Water
6.6 Ft.
River
UPLAND
UPLAND
Water table
Stream
Groundwater Discharge
Depressional Wetland
Overflow Wetland
Deepwater Habitat
Overflow Wetland
Seepage Wetland on Slope

Almost 35 percent of all rare and endangered animal species are either located in wetland areas or are dependent upon them.

Some wetlands store water and release it slowly to groundwater deposits. However, many other wetlands are discharge areas for a portion or all of the year.


Plants
Fish
Decomposers

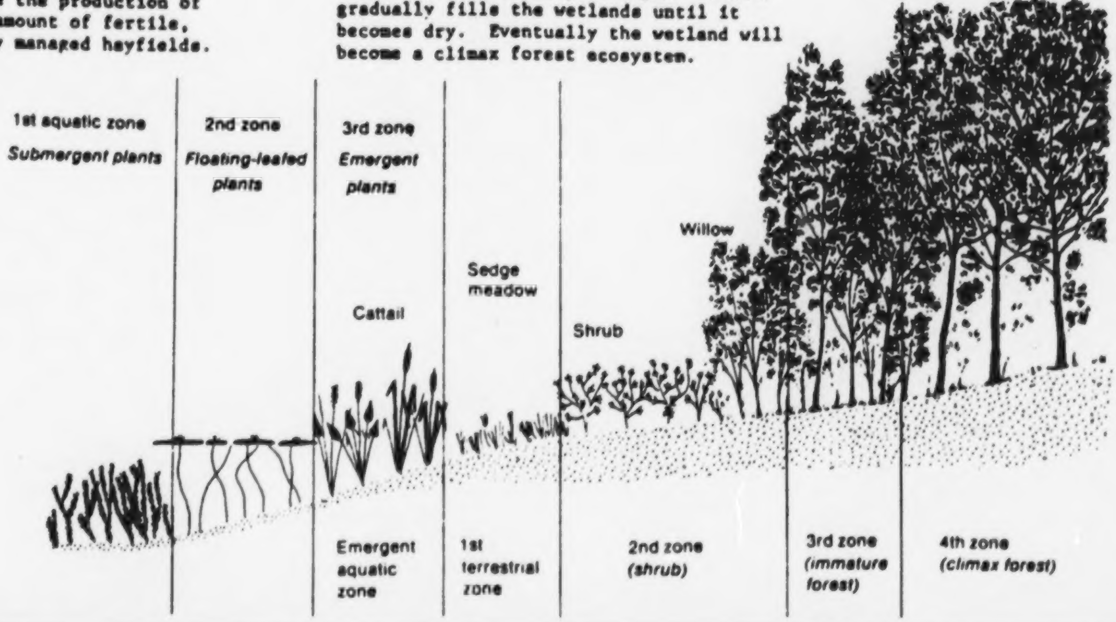


NET PRIMARY PRODUCTIVITY OF SELECTED ECOSYSTEMS [g/m²/year]
ADAPTED FROM LIETH (1975) AND TEAL AND TEAL (1969)

Healthy wetlands with a diversity of wildlife are a necessity for the stability of complex food webs.

Wetlands are among the most productive of all ecosystems. Ten acres of coastal marshes have been shown to produce ten tons of plant material, more than double the production of a similar amount of fertile, intensively managed hayfields.

Most inland wetlands are in a process of succession. As plants and animals die and decay, the buildup of organic matter gradually fills the wetlands until it becomes dry. Eventually the wetland will become a climax forest ecosystem.


1st aquatic zone
Submergent plants
2nd zone
Floating-leafed plants
3rd zone
Emergent plants
Cattail
Sedge meadow
Shrub
Willow
Emergent aquatic zone
1st terrestrial zone
2nd zone (shrub)
3rd zone (immature forest)
4th zone (climax forest)

Moving Into Winter

Thoughts on Using the Teachable Moment

It is raining. Not the kind of rain that can be celebrated in early autumn. Not the warm rain of late summer, feeding the field of corn and the garden. It is raining that long, steady kind of rain which soaks through every layer of clothing, which chills the bone and dulls the mind. It is raining, the kind of rain which continues until it fills every hole, every low spot, every crack, until it fills the earth full, so that the grass sloshes up with every step. It is raining, an all day rain which drips from every roof beam, every leaf tip and twig and building corner and wire.

I have been staring out the window now for awhile, held captive by the constant patter and drip and occasional gust of wind sweeping through the downpour. The window itself has become a kind of pallet on which the raindrops create a moving scene. An occasional drop hits the top of the pane and begins to run downward, picking up other drops along the way. A parade, a river, a stream of thoughts. Just as suddenly as it came it reaches the bottom and the stream breaks apart into beads again, and then another drop hits the top.

My mind is a window also in autumn, that clear surface to which my thoughts cling like water beads. Inspired, a thought comes rolling down and connects with others, forming a rivulet, a stream of consciousness, which runs its course and eventually breaks to beads again.

Last week the creek bed was dry. Today when I passed it, the water was flowing a good four inches deep, tumbling, turning along the bottom. Just last week I had walked in it. Overturning the stones, kicking, feeling some of what the stream must feel as it flows along. On my walk, I followed it, seeking where it wanted to go, when I came to a place where the ground fell away and a waterfall had once been. Today, at the same spot, I found the falls alive again, sputtering, splashing, rushing down. The creek, as it moves along, is so much like a group of children walking together, talking. The falls *is* children, running, screaming, falling down, shouting, pushing, rolling free, with wildness abounding. The power in the falls, a power of release, of letting go, becoming free, is the power we find in children during recess.

The creek, in its bed, is more like the classroom, rolling along, flowing and occasionally with a great rain—overflowing and spilling out on to the land. To me, those are the moments when the classroom is most alive, when the creative energy of the children is greatest. If only this creative energy could be channeled into a real enthusiasm for learning, then it would overflow from the schools into all of the children's lives.

But then, in general, we all have a difficult time with this overflowing,

with the unexpected swelling of the forces of nature, to the point where they force us out of our routine. We call them crises, and fear them somewhat, and when they are finished, we understand the great opportunity which they brought us. (These two, crisis and opportunity, are really the same, and the chinese word for them is identical.)

Many of the teachers which whom I have talked recently will not take their children outside because of this overflowing. They say the children are difficult to control, that it is hard to focus their energy and attention, and that the possibility of something going wrong is too great.

To me, every outing is a great opportunity to learn how to be spontaneous, alert, and creative, and to use the teachable moment.

This summer, our ten-year-old group was sitting in a circle on the grass for a story. One of the boys, the most disruptive one, stood up and walked away in the middle of the telling, oblivious to my pleas to stay put. I decided to let him be, for a moment, to trust the situation. He turned away, took three steps, tripped and fell flat on the ground. When he stood up, he was covered with a thousand burrs. Saddened, he returned to ask for help. We all helped him pull off the burrs, and it turned out to be the perfect opportunity to learn about seeds and seed dispersal.

Another time this fall, standing in a clearing, the wind began to blow, and soon leaves were falling around us. The children couldn't contain themselves, and in an instant, were chasing the leaves, trying to catch them before they hit the ground. I let them play for a couple of minutes and when we came back together, we made a real game out of the chasing, and it became the basic experience which led into our exploration of autumn, leaves, leaf shapes, aerodynamics, and more.

From these experiences, I have simply found that when things seem to fall apart in the classroom or outside with children, it is often a great opportunity to help the children re-channel their energy, and this allows us to put things back together in a new and creative way.

It is still raining. I can see the creek running a bit faster, holding a bit more water. The puddles have grown to where avoiding them as I walk on the road is a challenge. I walked over this road awhile back with one of the children, and as I watched carefully to avoid the puddles, I noticed how he watched even more carefully so he could step in each one. On the way back, I tried it his way, and understood a bit more about his creative energy. It is much more exciting stepping in the puddles than avoiding them!

by Michael Soule

The Ecosystem of Environmental

Most people who have spent any time at all working in the field of Environmental Education are aware that it is a rather complex field. Whatever form of program one is dealing with, whether outdoor recreation, challenge and adventure, urban studies, or environmental studies, at any grade/age level, there always seem to be a host of factors which must be considered in the design, implementation and operation of the program. Similarly, the discussion of any environmental issue, whether pollution, population control, or global armaments, always seems to entail dealing not only with the "facts" but also with the "feelings", opinions, values, and previous experiences of those involved. The response which some teachers take to this complexity is to act as if it wasn't important, or to try to assume that by dealing with one factor, such as knowledge or skills, or processes, the others will somehow look after themselves.

All education, environmental or otherwise, entails the interaction among a number of factors. It is this complexity which makes it difficult to reduce education to simple, black and white solutions, whether knowledge, or student/teacher interaction, or curriculum, or teaching strategies, usually leads to a less than adequate program and to feelings of discontent (at least in the long term) on the part of teachers or students. As Stafford Beer, a leading thinker about management and systems pointed out some time ago, the way to manage complexity or diversity is *with* diversity.

In Environmental Education we are both blessed and cursed with subject matter and teaching-learning environments which are interesting and even attractive. It is easy to become so centered on the importance of the issue, i.e., "acid Rain" or on the attractiveness and wonder of the locale, i.e., a rich beach at low tide, that we lose sight of the totality of what we are doing when we invite students (or ourselves) to examine the relationship between ourselves and our total environments. We get caught up in the experiemce or in the issue.

For these reasons my graduate students and I have developed a little "toy" to help us think about what we are doing when we design or operate an Environmental Education program, of any type. We don't really know what to call this "toy" or "tool" although we have considered calling it a "Holistoscope" or a "Metascope". Like most tools it is an aid to thinking *and* to action. It is also a means of helping us to focus our attention on the major elements which interact within the "Ecosystem" of any Environmental Education program.

The diagram which accompanies this article illustrates the basic form of the Holistoscope (as I shall call it here). As can be seen it looks like a series of concentric circles. In actual fact, we make these by making a set of different sized cardboard discs, each with a hole in the center. We then mount the discs, arranged in order, larger to smaller, on a common axle, which we form by using a duo-tang type split pin. When this is done, the two discs can turn independently, with the edge of the larger disc being visible all around the circumference of the smaller one.

Printed on these discs we have arranged a number of terms. Around the circumference of the outer, larger disc we have printed terms for the various SETTINGS or CONTEXTS of environmental education. These are based on a paper written some years ago for the Social Studies Journal by Harvie Walker and I entitled "The Dimensions of the Human Environment." They are: PERSONAL, INTERPERSONAL, LOCAL, REGIONAL/NATIONAL, INFORMATIONAL/CULTURAL, and BIOSPHERIC. The basic intention here is to call our attention to the fact that

Education

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there is no such thing as *the* environment. The environment is SUBJECTIVE, based on the personal experience or meaning system of the person who is experiencing it. To some extent the environment is also COLLECTIVE, that is, our cultural heritage influences how we perceive and interact with the environment (including ourselves). This sort of concept of environment is closer to the meaning of the german "Umwelt".

An Umwelt is quite different from the English language sense of "surroundings" or of the stuff which is "out there" outside and apart from us. An Umwelt stands for organized experience that is not shared by all creatures but which is special to each creature, to each person (Kohl & Kohl, 1977).

I won't take the time and space here to give detailed explanations for each of the contexts that I've listed above. Briefly, we can see these contexts as progressing from the person, through their self-awareness, knowledge, meaning systems and so on, outwards progressively to their interpersonal contacts with other people and with other living things, to their own immediate life space, their neighborhood, their possessions, their environment of daily experience, through to the larger regional, national, political contexts, and finally to the entire planetary system, the biosphere (I suppose I should include a cosmic context, but since we don't experience that context directly very often, at least as yet, I've omitted it). Because human beings are not only creatures of the here and now, but live in the past and the future through their cultural and informational networks, I've included that as a separate context on the circumference of the outer disc also.

Of course, you may not like these terms (I find some of them rather clumsy myself). If so, feel free to invent/define your own contexts. The point is that the human environment is at least as complex as the "equipment" which we have to experience it with (some would even say *CREATE* it with).

Arranged around the circumference of the inner circle are eight processes which are always in operation as humans experience their environments. These processes, acting together, produce the Umwelt for each human being. They are, moreover, synergetic in their interaction, which is to say, the SUM is MORE THAN THE PARTS. It is possible, and even necessary to pay close attention to any one of these elements, or to some sub-set of them, but we can never escape the fact that they are always in constant interaction.

In writing these processes I have used the "-ing" ending for each. This is deliberate and has a definite purpose. David Bohm and Gregory Bateson have both urged us to pay attention to the differences between states and processes and to recognize that the English Language in particular seems to be noun-dominated—it is rich in state words for systems which are actually processes, or collections of processes. Thus, for example, people speak of "HEALTH" or "EDUCATION" as if these were states or collections of static objects. People think of themselves as having or getting health, or of being Educated, of possessing a lot of Knowledge Stuff (being, as Bruner put it, "living libraries"). In fact, of course, we know that health is a process, which one must work at through life, actively, constantly and that learning is a life long process as well. So, the -ing endings are intended to make us pay attention to these as processes not as products or states. What are the processes we have identified?

After a lot of discussion, debate, and consideration we have settled upon eight processes in the Environmental Education Ecosystem. They are: KNOWING, ACTING, IMAGINING, VALUING, JUDGING, OPENING, INQUIRING, and CONNECTING. I will only attempt to

BEST COPY AVAILABLE

give a brief description of each of these here—books could (and have been) be written about any one of them.

First, Knowing is perhaps the most common element addressed in most schooling. This process however is not simply the STUFF, the knowledge we commit to our memories and use frequently, but also the process of constantly taking stock of our ideas, of dealing with their validity, their currency, and so on. Second, Inquiring simply indicates that whole cluster of processes which involve knowing how to know, of understanding where and how to find out, of knowing how to become a self-directed learner, and so on. Obviously, Knowing and Inquiring are linked (but then they all are). Third, Acting entails applying knowledge and other skills, etc. in a real setting, attempting to try something out, to produce a result, to get information or feedback. It has been said that school systems sometimes seem to make people Information Rich and Action Poor, but I certainly don't think that school systems are any more to blame for this than is Television or many forms of parenting. Without action students are simply cut off from all sorts of information which they need to shape Knkowing and Inquiring (and valuing. . .etc., etc.). Fourth, Opening is the terms we have employed for the topic of awareness. Somehow "Awaring" seemed awkward, so we settled on Opening instead. What is meant is the process of making ourselves available to experience. In my view, many people use a great many devices to deliberately close themselves from certain awareness or experience. Many other people, probably all of us to some extent, fall in to quite rigid patterns which have the effect of delimiting our experience, of keeping us closed. To some extent what challenge education programs do is to deliberately shake up the old tight day-to-day perhaps unconscious patterns and habits which we use to keep ourselves closed and make us open up. The key point is, however, that people need to learn how to open themselves and to keep on opening virtually daily, and not just when some experience salespeople or gurus happen to be on hand.

In my mind educational ecosystems which focus on one or two processes, often to the exclusion of others, are as distorted as ecological monocultures.

The fifth process is Imagining. This process is vitally important because I see it as closely linked to "creativity". Through imagining we create new combinations, perceive patterns and relationships, and add to our store of ideas and inventions. Imagination is to the mental ecosystem what "mutation" or genetic change is to the biological system and to evolution. Without it, the entire system would become static and decay. Imagination is also at the core of empathy—it is, in my view, impossible to be empathetic without being able to perform the act of imagination required to see through another person's eyes, to live in their "skin" so to speak. It has been said that when reason sleeps, monsters wake, but I think that this may be as true of imagination. The sixth process is Judging. Judging has to do with the personal process of deciding, choosing, evaluating consequences, generating alternatives. It is at the heart of decision making and of ethics. It is, of course, completely tied up with the seventh process, Valuing. Valuing means examining and clarifying, for oneself, what one's values are, of choosing, of considering alternatives, of deciding whether one's values are appropriate or not, or need changing or not, etc. Of course values and action are linked as well, in fact, Value theorists like Louis Raths would say that without action there are no values. Values are defined by affirmation and affirmation-action shapes values.

The last process is that of Connecting. Connecting has to do with Systems Thinking, with the ability to see cause and effect, inputs and outputs, consequences and alternatives. It has to do with enlarging one's perspective and learning to think "ecologically" or "globally". It demands *both* right and left brain modes of thinking.

Again, there is no reason to believe that I have identified all of the elements which belong in this Environmental Education ecosystem, but I think we have hit on some important ones. I would invite the reader to develop their own, or to extend-refine these.

Inevitably the question of "so-what" will arise. The way to use this tool is simply to identify a content area or program focus or issue, for example, The Kids and Junk Food controversy. This issue operates mostly (but not entirely) at the personal, interpersonal, and local contexts. So, let us suppose that we address this issue via the eight processes and from the personal context of the kid. What can kids find out about junk foods? What do they already know, or think they know? Where can they get good information (how will they know whether or not it's any good)? What sorts of values are associated with whether or not they eat, or don't eat junk foods, or how often, or in what quantities. Can they imagine what the world would be like without these? Can they imagine what they would be like without them? How can they decide what should be done?

It has been said that school systems sometimes seem to make people Information Rich and Action Poor, but I certainly don't think that school systems are any more to blame for this than television or many forms of parenting.

Can they form a plan of action? Can they set it in motion and evaluate its results? Do they do it? What are the connections between junk foods and our whole modern life style? What would be the environmental or energy consequences of eating less/more of them? What would happen to our social lives?

Well, I think this short illustration demonstrates how, by spinning the inner circle, each of the eight processes is brought to bear in the issue and context. Why should this be important or useful? The answer to this is simply that it isn't if you don't care about the full effectiveness of your teaching or of what students learn. If you just want to treat the Junk Food issue as an interesting unit, with a lot of information in it, after which kids may, for a while, eat less junk food, but with many of them eventually going back to sloppy food habits, or never changing at all then it doesn't matter that you take this approach. In my mind educational ecosystems which focus on one or two processes, often to the exclusion of the others, are as distorted as ecological monocultures, and just as unstable or demanding of high energy for their upkeep. It is possible to take the view that schools *only* deal with kowledge (and not even with knowing), but the consequences may be the production of verbal, articulate, literate people who are human cripples in many other areas. If education really has something to do with the progressive development of whole human beings, then we need to operate systematically (ecosystematically) to achieve this or to foster it as least. In my view, distorted educational ecosystems are often manifest in behaviors which are self destructive, people destroying, or environmentally damaging. They are the sort of people who make social decisions on strictly limited economic grounds, with the sort of results we are now witnessing in B.C. But the first step towards managing complex, dynamic systems is to be able to see that complexity and to sort it out. Hopefully this little tool may help you to do this.

One final word. In the center of the prototype model that I've made is the equation that TIME 1 does not equal TIME 2. . . and so on. This is just to remind me that the whole Educational Ecosystem, like all the biological systems, are constantly changing. The message is a reminder to myself that we need to see things as constantly in development and evolution. I hope you will also.

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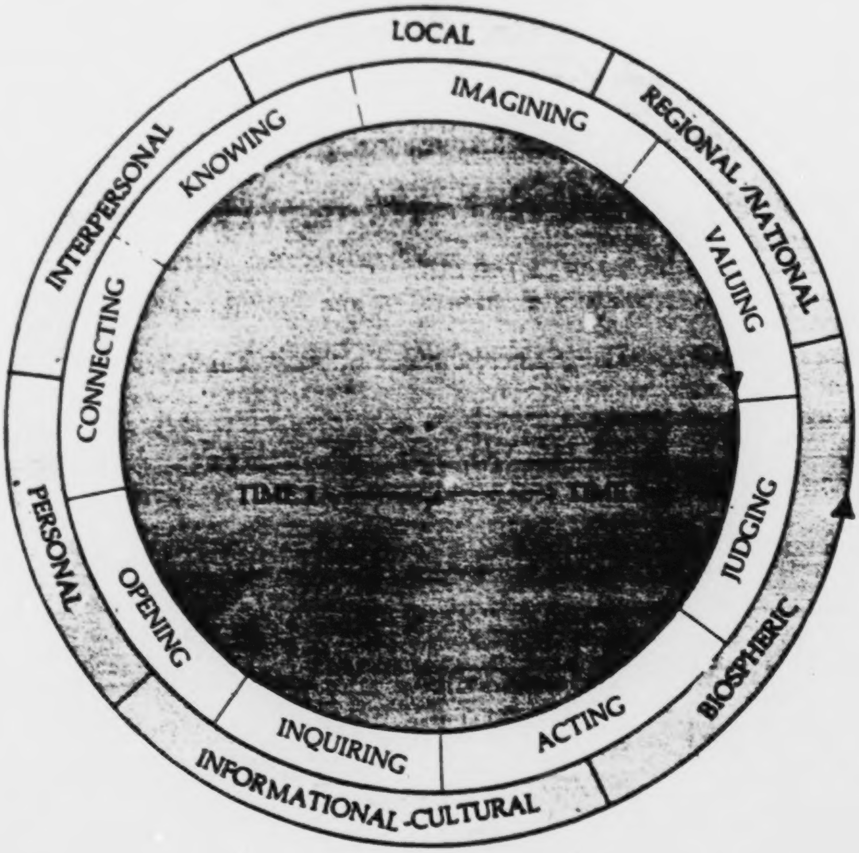
The Holistoscope



NOTES

1.) The two concentric circles are typically printed as discs of different color card stock, and are then threaded on a common axle made from a split pin fastener. In this way they can be rotated independently.

2.) The titles on the lower half of each circle have been re-oriented for readability in this figure.

BLUEPRINT FOR A BLUEBIRD TRAIL

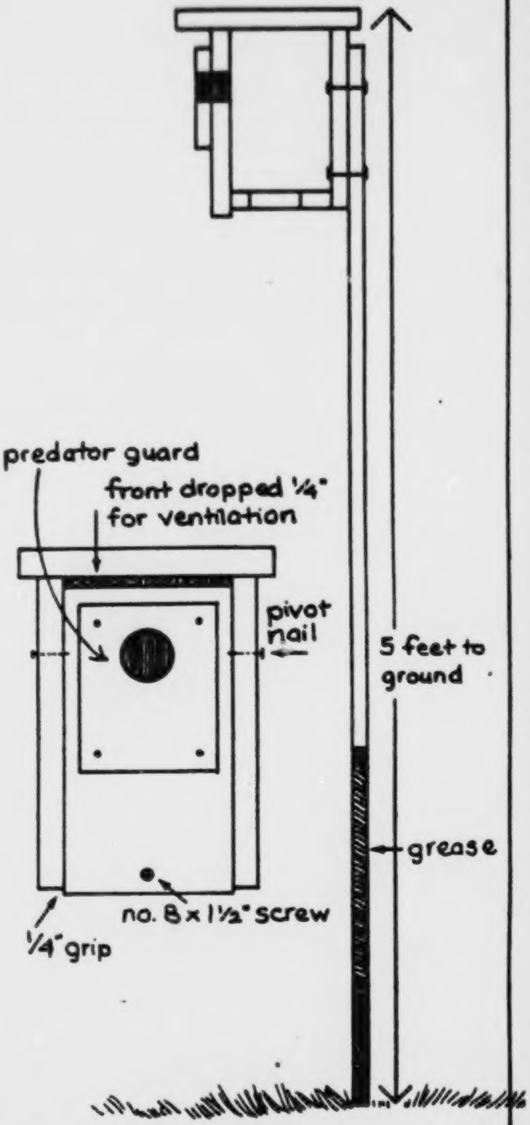
What is a Bluebird Trail?

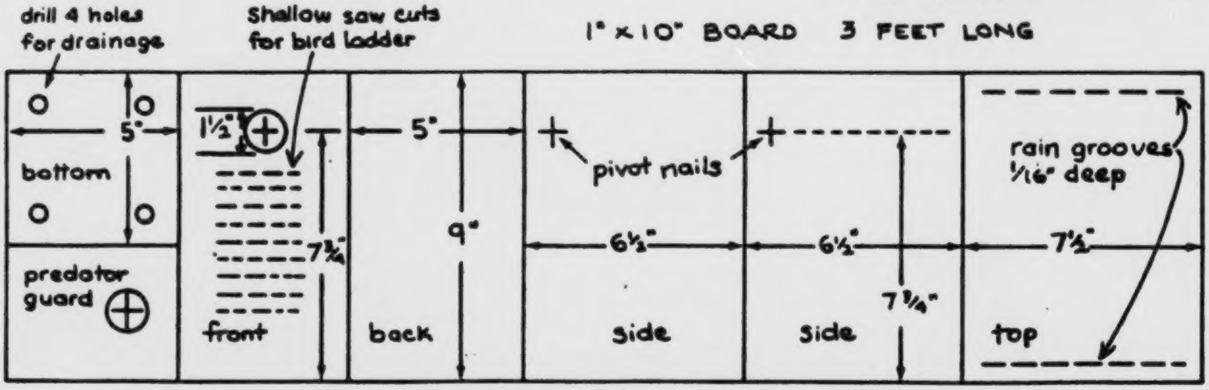
A bluebird trail is five or more bluebird nesting boxes mounted on fenceposts or pipes. The boxes are spaced from 100 to 200 yards apart on a farm, park, cemetery, or golf course. Bluebirds prefer open areas with scattered trees. A "bluebirder" hits the trail every week or two to check the progress of the tenants. Boxes at eye level can be inspected with a penlight and mirror without disturbing the occupants.

Where Do We Begin?

It takes only three feet of 1" × 10" pine board to make a bluebird nesting box. Mark the board as shown in this diagram. Since all cuts are straight, no special tools are needed. Use galvanized nails, and glue all permanent joints. The predator guard is simply an extra piece of wood around the entrance hole; the added thickness makes it difficult for intruding beaks or paws to reach the nest. A 1½" entrance hole will keep starlings out but allow bluebirds easy access. Make shallow saw cuts on the inside of the front so the baby birds can climb out of the box when they're ready to test their wings. The front is made to swing out on pivot nails so that you can clean out the old nest at the end of the season.

Mount the box on an old piece of pipe with carriage bolts, or nail it to a stick and strap the stick to a metal fencepost. Apply some grease to the pipe or stick to keep snakes and egg-loving animals from climbing up and helping themselves.


predator guard
front dropped ¼" for ventilation
pivot nail
5 feet to ground
grease
no. 8 × 1½" screw
¼" grip


drill 4 holes for drainage
Shallow saw cuts for bird ladder
1" × 10" BOARD 3 FEET LONG
5"
bottom
predator guard
1½"
7¾"
front
5"
9"
back
pivot nails
6½"
side
6½"
7¾"
side
rain grooves 1/16" deep
7½"
top

This information courtesy of National Audubon Society, Northeast Region, and the Federated Garden Clubs of New England.

How to Create a Critical Thinking Center

By Christie Ford.

Two of the essential skills needed by students who will be facing environmental challenges in the future are those of critical thinking and problemsolving. Rather than acquiring or developing a set of established opinions, students need to develop a process for "thinking through" an issue, locating resources, and working out creative solutions based on all the facts and resources available.

Christie Ford, an elementary teacher at Westridge School in Lake Oswego, has implemented the following format for a Critical Thinking Center, based on an idea developed by Susan Kovalik, an educational consultant in San Jose, California. Her students learn about subjects, such as birds, or whales, by using the six steps of **Bloom's Taxonomy** *of educational processes. This format can be applied as a method of introduction to nearly any subject.*

The following is an outline of the format used by Christie, along with an example of a unit her students completed this spring in her classroom.

Creating the Critical Thinking Center

1. ***Choose a theme.*** *It could be part of your social studies or science curriculum, or follow the subject of a story in your basic reading text.*
2. ***Use the process verbs*** *from Bloom's taxonomy to create activities at all six levels of thinking. Suggest as many different kinds of culminating projects as you can:*

games
model
newspaper
mobile
comic strip
song
graph
want ad
map
collage
puppet show
diorama
diary
travelogue
recipe
debate
diagram
letter
mural
movie
choral reading
poster
book
skit
time line
questionnaire
commercial
ABC book
museum
interview
learning center

Present your activities *in an attractive manner: task cards, bulletin board, book. Think about coding them according to thinking level (i.e., knowledge, comprehension, analysis, etc.). I typed all my bird unit activities onto colored labels, a different color for each level of Bloom, and adhered them onto 18 inch colored tagboard puffins that hang all over my classroom walls. Since we do this in spring after much experience, each child is required to do two of each color.*

Provide as many research resources *as you can: books, posters, addresses, films, filmstrips, telephone directories, (Clearing?).*

Provide a wide range *of materials to work with: paper, fabric, yarn, string, pens, paints, boxes, etc.*

Using the Critical Thinking Center

1. ***Create an interest*** *in the subject: take a field trip, show a film, read a story, brainstorm what kids already know and what they want to find out.*
2. ***Teach children how to ask questions.*** *"If you wanted to compare the feeding habits of birds, what would you need to find out?"*
   - *a. What are five birds I want to find out about?*
   - *b. What does each bird eat?*
   - *c. How does each bird get its food?*
   - *d. Where does each bird get its food?*
   - *e. How much does each bird eat?*
   - *f. When does each bird eat?*

   For best results, this should be repeated a number of times with different questions. This is very hard for many children to do.
3. ***Provide a planning format.*** *I provide 4th, 5th and 6th graders with the following:*

   Project Summary ______________________________
   ____

   Five questions I need to answer:
   1. ______________________________
   2. ______________________________
   3. ______________________________
   4. ______________________________
   5. ______________________________

   Resources I can find information in: (list book titles)
   1. ______________________________
   2. ______________________________
   3. ______________________________

   Materials I need for my finished project: ______________
   ____
   ____
4. ***Teach students how to take notes.*** *I use the following process from 2nd grade up:*
   - *a. Students brainstorm five questions. Teacher writes on blackboard. Students copy into research notebook; two questions per page with room to write answers in between.*
   - *b. Teacher locates possible answers to questions in books. Teacher reads aloud a paragraph to class. Teacher closes book and asks students if they've heard anything that answers*

one of their questions. When they give answers in whole sentences, teacher writes information in key words on the board:

eagle: fish, mice, other birds

- c. *When all questions on board have notes, students copy notes into their own notebooks.*
- d. *On chalkboard, teacher takes one set of notes and asks students to number them in the order they should be written out.*
- e. *As a whole class, students write notes out into paragraphs, adding any extra information they remember. Teacher writes paragraphs on board. Students copy onto paper.*
- f. *Whole group may do all paragraphs together, or may do one together and then try one on their own.*

5. **Introduce students to center.** *I start by allowing them to choose any activity they want. This will give you a clue as to what level they are comfortably working at. Later on, you may want them to choose a selection of activities from each level. In the beginning, I ask students to complete one or two a week.*
6. **Explain the process.** *I check each step of the way: after questions have been written, after note-taking is completed and before project is started, and after project is complet;ed.*
7. **Allow independent work periods** *in which students can become involved and concentrate on their choices. I use a language arts period on a weekly basis. Students work on project choices along with handwriting, spelling, etc. assignments that are assigned at the beginning of each week. During their independent work time, I meet with reading groups.*

9 *I have found that group sharing and evaluation, along with a personal written evaluation covering areas previously explained to the students is sufficient for completion. The areas usually evaluated are neatness, effort, detail, originality/creativity, and information.*

Keys to Success

1. **Encourage creativity! As soon as one student is successful, share the results and ask for comments and observations.**
2. **Set high goals. Talk about "stretching your brain!"**
3. **As students complete projects, provide time for large group sharing. Let children learn from each other. Children will incorporate successful details into their own work.**
4. **After the students have completed the first project, talk about the different thinking levels with them, and challenge them to try something a little risky!**
5. **Plan an open house so students can share their successes with their families.**
6. **Keep on trying it! I use a different one every month. The results get better and better!**

Process verbs used for stating learning objectives according to Bloom

Knowledge	**Verbs**		
**The learner can remember facts.*		**define**	**label**
**The learner can recall facts.*		**recall**	**report**
**The learner can locate facts.*		**describe**	**narrate**
		identify	**memorize**
		list	**attribute**
		match	**ask**
		name	
		recite	

Comprehension		
**The learner can demonstrate understanding.*	**explain**	**translate**
**The learner can change knowledge to another form, i.e., paraphrasing, graphing.*	**summarize**	**rearrange**
**The learner can interpret.*	**interpret**	**locate**
**The learner can predict outcomes and effects.*	**rewrite**	**demonstrate**
	estimate	**discuss**
	convert	**show where**
	infer	**match**

Application		
**The learner can use what has been learned in a new situation.*	**demonstrate**	**model**
**The learner solves a problem using the knowledge and appropriate generalizations.*	**report**	**dramatize**
	record	**organize**
	construct	**interview**
	collect	**simulate**
	experiment	**paint**
	change	**solve**
	operate	**plan**

Analysis		
** The learner can separate information into component parts.*	**outline**	**inventory**
**The learner can understand the organization and the relationship of its parts.*	**diagram**	**survey**
**The learner can note similarities and differences.*	**order**	**contrast**
	categorize	**dissect**
	debate	**group**
	compare	**correlate**

Synthesis		
**The learner can integrate information, ideas, concepts or skills to form an original conclusion.*	**design**	**modify**
**The learner creates something new and different.*	**compose**	**catalog**
	invent	**propose**
	improve	**assemble**
	originate	**create**
	adapt	**produce**

Evaluation		
**The learner can support a judgment with reason and/or criteria.*	**appraise**	**prove**
**The learner can make qualitative and quantitative judgment according to set standards.*	**recommend**	**evaluate**
	select	**defend**
	justify	**project**
	criticize	**estimate**
	debate	**support**
	argue	**conclude**
	predict	**suppose**

A Sample Unit of the Critical Thinking Center: Birds

Knowledge

1. Read three different folktales about birds. Try to read tales from different countries. Write down the titles and author.
2. Make a sketch of your favorite bird and label 15 different parts.

Primary grades: Draw pictures of and name three birds you see around your school.

Comprehension

Make a list of ten different ways in which birds are helpful or harmful to humans.

On a world map, locate the range of 10 different bird species.

Primary grades: Make a mobile of a bird you like and what you know it eats.

Application

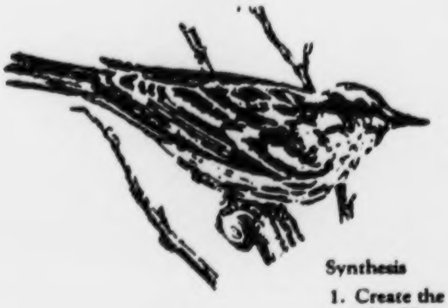
Write and perform a play or puppet show about the folktales you've read. Think about costumes, sets, etc. Amaze us.

Interview an amateur birdwatcher. Prepare at least 10 questions. Record their answers.

Design a birdfeeder for one specific type of bird. Explain what that bird eats.

Pretend you are a bird psychologist and interview your favorite bird. What kinds of problems does he have?

Primary grades: Invent a new bird and tell us where he lives, what he eats, how he moves, etc. Can you make a poster of it?



Analysis

1. Compare the sizes of eight different birds by presenting a poster of their silhouettes. Can you make them "to scale!"
2. Compare the eggs of six different bird species. Use illustrations and words. Think about color, size, shape and shell thickness.

Primary grades: Describe a bird you like from a viewpoint of a visiting outer space alien.

Synthesis

1. Create the perfect bird island. Make a map of it. Use your imagination to make it the perfect environment for a number of different bird species. Who lives there, what do they eat? How do they entertain themselves.?
2. Publish a newspaper for birds. Include articles on events, ads, sports, comics, letters to the editor, a home section, etc.
3. Design a menu for the brand new bird restaurant, "The Wormery." Think about all the different things birds eat!

Primary grades: Design a picture of the perfect backyard for birds. What kinds of plants would you need?

Evaluation

Debate the choice of the eagle as our country's national symbol. Are there any other choices you would have made? Why?

Assess the four greatest dangers you see to world bird communities. What recommendations would you make to avoid those dangers?

Primary grades: Which of the birds you know about would you like to be and why?

Note: Primary activities can be efficiently conducted as a whole group activity.

Earth Magic

by Steve Van Matre

Have You Listened To The Earth?

Yes, the earth speaks, but only to those who can hear with their hearts. It speaks in a thousand, thousand small ways, but like our lovers and families and friends, it often sends it messages without words. For you see, the earth speaks in the language of love. Its voice is in the shape of a new leaf, the feel of a water-worn stone, the color of evening sky, the smell of summer rain, the sound of the night wind. The earth's whispers are everywhere, but only those who have slept with it can respond readily to its call.

The earth speaks in many ways, on many levels. For the Australian Aboriginals, perhaps the oldest continuous culture in the world, the features of the earth are an everyday part of their living heritage. They read their story of life in the landscape itself. For them every mountain, every river, every valley speaks of ancient events. A gigantic monolith becomes a rock dropped from the sky, a stone outcropping an effigy figure, a mountain range, a great lizard. For the modern geologist, the earth speaks of ancient events as well, but in this instance, those features are the direct result of the natural phenomena of the planet. A hill represents a glacial remnent, a solitary boulder an erratic, a cannon a timetable. However, for the earth lover, each fold, each depression, each peak in the crust of the planet speaks of new discoveries in a lifelong quest to seek out magical places, to be initmate with the earth and its life.

Yes, falling in love with the earth is one of life's great adventures. It is an affair of the heart like no other; a rapturous experience that remains endlessly repeatable throughout life. There is no fleeting romance, it's an uncommon affair, one that is unconstrained by age or custom, and strengthened rather than diminished through sharing. In fact, the more one gives it away, the stronger it grows.

The earth speaks in magic, the magic of rainbows and waterfalls and frogs. It is the magic of interacting sunlight and air and water and soil creating a constantly shifting kaleidoscope of wondrous riches on our turning planet. In fact, for someone visiting earth for the first time, the real treasures here would all be free. The smell of a sunlit prairie, the taste of a cold cup of spring water, the crunch of trackless snow underfoot, these are some of the earth's supreme treasures. On intergalactic maps, if there are such things, the place where we live must surely be designated as a magical garden in space, a place of astounding beauty. Picture for a moment people arriving here in a rather sterile, lifeless spaceship. For them the earth would certainly be a precious oasis in the cosmos. Such space travelers would know the earth as a place to quench their thirst for the wonders of life itself, a stopping point for sustenance beyond the necessities of food and water. They would no doubt travel great distances to marvel at what we have here, to discover anew this amazing source of adventure and inspiration and joy. There must be many worlds where we would be envied greatly for our good fortune, worlds where the conditions for life are much harsher. Yet ironically, there are those among us who suggest that because we are fouling our home we should dream of getting off. If there are intergalactic travelers likely to visit us, will we not also be seen as childish fools who could not control our appetites?

Come experience the earth with us. Set aside some time each week to get to know your place in space. In addition to being a day of rest, perhaps Sunday should be a day of exploration and discovery for all of us. We need a day dedicated to getting out of our man-made structures, to leaving our urban colonies; a day spent outdoors celebrating the wonders of life; a day cavorting, if you will, in our garden in space.

There's a magical story about St. Francis enjoying the night air one evening in the village of Assisi. When the moon came up, it was huge and luminous, bathing the entire earth in radiance. Noticing that no one else was outside to enjoy this miricle, Francis ran to the bell tower and began ringing the bell enthusiastically. When the people rushed from their houses in alarm and saw Francis at the top of the tower, they called out asking him to explain what was wrong. Francis replied simply, "Lift up your eyes, my friends. Look at the moon!"

Sometimes all that is necessary for hearing the earth's voice is just to get out of our boxes like the people of Assisi did one memorable evening. But often, it means going farther away from the world of people, casting off layers of the synthetic and artificial substances with which we have encased ourselves. We have listened too long solely to the voices of our own kind when, in reality, we share this vessel with a grand multitude of other forms of life. Since they do not speak our language, we must seek them out and learn theirs.

"But ask now the beasts,
and they shall teach thee;
and the fowls of the air,
and they shall teach thee;
Or speak to the earth,
and it shall teach thee;
And the fishes of the sea
shall declare unto thee."
JOB 12:7-8

The point is, we desperately need to put aside our human acquaintances for a while (and yes, our books, too) and go away from the world of words, to communicate on a different level, to get close enough, as Edward Abbey suggests, to learn what the mountain lion has to teach us.

Although the earth speaks to everyone, only a few respond. Sadly, there are many among us who can no longer hear the earth's song. They have lost their innate abilities to perceive its underlying harmony; they have become entrapped by their own contrivances. Consider the example of an obviously bored teenager rounding the corner of a zig-zagging trail along the Big Sur Coast of California and exclaiming in a whiny voice, "Awwoh, it's the same view." Faced with indescribable beauty this young traveler could only complain that she had seen it before. Standing on the threshold of what could well be the most lasting love affair of her life, she was unable to sense her lover's charms. We have so filled our lives with artificial nonsense and distraction that many of us can no longer hear the earth's voice. We need new teachers to help us rebuild a sense of relationship with the earth, and to remind us, as the Chinese philosopher Li Po suggests, to loosen our hair and go fishing.

Come, listen to the earth with us. For those who have learned to hear its song the earth can soothe the troubled heart, refresh the weary, soften the hardened, redirect the lost. And in the end, it is unlikely that you will ever find an earth lover holed up in some sterile urban box slowly withering away—withdrawn, sad, bitter. Earth lovers retain their vigor, their zest for life. For them the natural world remains an inexhaustible source of delight: the sounds, textures, colors, shapes, patterns, harmonies; the sensate joy, the enchantment, the endless surprises. Earth lovers know that no man-made setting can ever hope to attain the richness, the drama, the meaning found in most any patch of wild land. Like a bottomless well in our oasis in space, the wonders of the earth can be drawn upon to recharge the spirit for all of one's days. Be an earth lover. Sleep with the earth. It will teach thee.

Steve Van Matre

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DISCOVERY ACTIVITIES FOR AWARENESS

The following activities first appeared in the publication ***Healthy Seedlings for a Healthy Environment,*** *produced by the Environmental Education Project for the 42nd National Longhouse of the Parent Child Programs of the YMCA. They are intended to help you explore the environment of your home, community, and natural world with your children. They are designed to develop an awareness and sensitivity toward our surroundings.*

Since the activities were originally designed with YMCA groups in mind, some of the activities mention "your tribe". This can be interpreted as meaning your classroom or any other group of adults and children. In addition, the activities were designed around the concept of native American attitudes toward the natural world, so occasionally reference is made to how Indians might have done something.

Use these activities in whatever situation you might be in, from classroom to community group to family. They are oriented toward the 6-12 age group, but can be adapted up or down as necessary. Developing a natural curiosity, a sensitivity, and an awareness toward ones surrounding environment is a first step toward their wanting to protect that environment.

Illustrations by Joan Barbour

Mini-Ecosystem

Together you can make your own "Green Community" by starting a mini-ecosystem in a jar with dirt, plants, animals, and insects.

A large jar or fishbowl
Plants or cuttings
Seeds
Soil
Rocks and pebbles

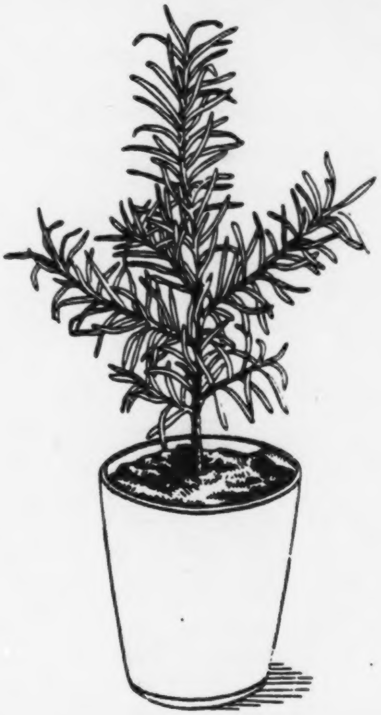
A Mini-Ecosystem can be housed in a large glass jar. Put one layer each of rocks and pebbles and sand in the jar, adding a layer of dirt. You may then plant cuttings or seeds or even an insect or two. Water your mini-ecosystem only once until soil is moist. Then seal your tiny jungle with plastic or a lid, and you can watch the water cycle happening inside it. If you have included insects allow enough air inside the jar for them to breath, and be sure to add water if needed.

Grow a Tree

Together you can learn to grow a tree from seeds and watch, nourish, and see it grow little by little.

At the end of summer or midsummer scout out trees that may have dropped cones with seeds. Big leaf Maple shed seeds in late fall, so you can get hold of seeds for trees at different times of the year. Take the seeds and place them in moist toweling. The best time to begin this is in winter near spring which makes the seed germination near its normal season cycle. Keep the towelling damp and check the moisture every day. Watch for germination of the seed. When the root begins to poke itself through the seed it is time to plant your tree. Place seed about ½ inch from the surface of a cup of dirt. Make sure the cup has a hole in the bottom for adequate water drainage. Water the seed everyday and place cup in window for sunlight. Watch for a sprout to poke up through the ground. Then carefully keep track every few months of how much your tree has grown.

How long does it take your tree to sprout? After a year how much has your tree grown? How long does it take a tree to grow before it is used for lumber? What do you have in your house that took trees to make?



Making an Aquarium

Together you can learn about wildlife by making your own aquarium.

Aquarium tank, sand, water, pebbles, plants, goldfish, snails (all materials may be purchased at a pet shop)

1. Allow the water for the aquarium to "age" for several days by standing in aquarium or other container.

2. Use coarse sand and wash it thoroughly. Wash stones or pebbles and then place sand and pebbles into boiling water.

3. Wash the aquarium tank. (Do not use soap or detergents.)

4. Place several inches of sand in the tank. The sand should slope to the front with only about one inch in the back. Add pebbles or stones.

5. Add water plants so that the roots are several inches below the sand.

6. Pour the water into the tank, being careful not to uproot the plants. The tank should be about two/thirds full.

7. Put the fish and snails into a jar and place the jar into the aquarium for about forty minutes before putting the fish and snails directly into the aquarium.

Having an aquarium is like having any other pet. You can learn about wildlife around you and their needs for food, shelter and care. As in an aquarium, wildlife in your community needs care too! How did the Indians care for the animals around them? You might make a presentation to your next tribe meeting about your wildlife aquarium.

Drying Flowers

Together you can learn about the art of drying flowers. You will make beautiful dried flowers.

Borax
Flowers
Holder (Shoe box or similar)

Place flower in holder on a bed of borax (about ½ inch) and gently cover with borax. Let stand for 1 week. Flowers should then be dry but some may take longer. We dry flowers, like the Indians dried many things, to preserve them.

Leaf Prints

Together you can explore leaves by using them in art projects to make designs.

Leaves
Cardboard
Spray paint
Crayons
Ozalid paper
Household ammonia
Jar

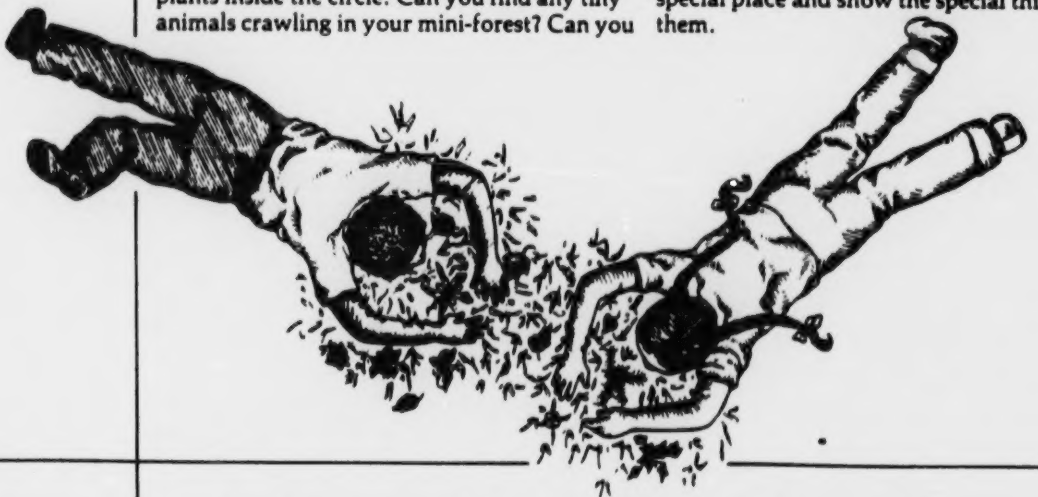
Pin leaves to paper cardboard and then spray the leaves.
or
Try putting a leaf, vein side up, on a piece of cardboard. Then put a thin piece of paper over the leaf and rub with a crayon. You will get a pretty leaf design.

Another idea which works well is to use ozalid paper (photo sensitive) for prints. You can purchase this paper in any art supply stores. The leaf is put on the ozalid paper, then the paper is exposed to the sunlight 15 seconds. Next, remove the leaf and set the print in a gallon container. Put a small jar which is filled with household ammonia inside the large container. Leave the jar with ammonia open. The fumes of the ammonia will set the print. Cover for several minutes.

Mini-forest

Together you can explore your own mini-forest to learn how plants and animals live together in a community.

Together decide to become mini-explorers. Find some place to lie down on the ground where grass or some other plants are. Make a circle by stretching your arms out in front of you on the ground. Looking into the area within your arms, try to find five different plants inside the circle. Can you find any tiny animals crawling in your mini-forest? Can you find any examples of things that are growing or things that are dead? Can you see any examples of things that are changing? Can you look way down in the grass and describe what you see? Can you find what makes this a special place? After exploring, bring friends over to your special place and show the special things in it to them.



Mail Waste

Together you can explore your mail to learn about wasted paper.

Family's mail for several days

Let your child be with you when you open the mail. Keep a record for several days—how many pieces did the family save and how many did you throw away? See if you can find out how many trees have to be cut down to make the paper for the "junk mail". What could you do about this problem? You might set aside a box and weigh it at the end of a week or month.

Can you find any creative way to use this "throw away" mail? Could it be used in an art project?

Track a Pipe
or
Where's the Well

Together you can explore the water system in your home to find out where the water comes from and where it goes.

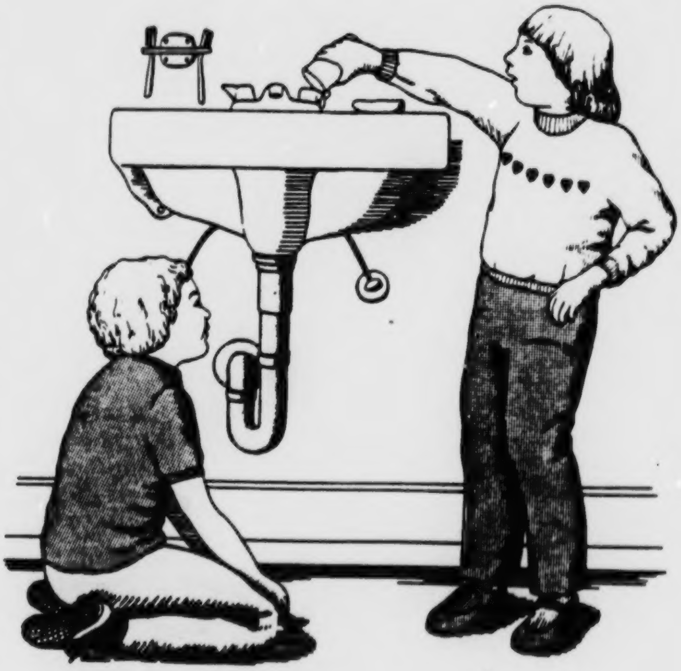
Paper and pencil (optional)

Drink a glass of water together. Then agree to become explorers ofyour home territory. Try to follow the faucet tap to its source. You can look in the walls, down the basement, and even out into the yard to the meter. Touch the pipes to get a feeling for hot/cold. See if it matters if the water is running. Listen to a still pipe and listen to a running one. Listen to your hot water heater, feel its heat. Outside you can explore the idea of a meter. What does it do for you?

Now dring another glass of water together leaving some in the glass. Pour the rest down the drain. Explore where it goes. Flush the toilet and listen to the pipes. See if you can locate the drain out of the house. You might try to picture where the water comes from in the community or where it goes. If you didn't have pipes, where would you go to get water? We have pipes gut the Indians didn't. How did they get their water?

Extensions:

Close your eyes and listen to water. Explore your house to find all the places water is used. How would you get your water? How could you store it and save it?



Ice Cube Races

Together you can learn about stored energy and insulation by seeing who can keep an ice cube from melting for the longest, or who can melt it the fastest.

Ice cubes, plates or pie tines, warious insulating materials (paper, foil, sweaters, etc.)

1. The game is to show how important insulation is in preventing heat loss from the home.

2. Rules. Each team will need an ice cube(s) of the same size. They are allowed 10 minutes to devise a way to prevent their ice cube from melting. Freezers, refrigerators, outside in cold weather are off limits.

3. At the end of 30 minutes-1 hour, the winner is the team whose cube melted the least. Discuss why.

4. Have a melting race, where the teams try to melt their cubes in the shortest time. Natural sources of heat are ok (sun, body heat) but you can't put them in the oven or in front of a heater.

5. **Tip:** Place the plate or pie tin under the cubes to catch the water as cubes melt.

Extensions:

From this we can learn a lot about energy and insulation. Where does the cold go? How much heat or work does it take to melt it? Where does this come from? If an ice cube was a cold battery, could we keep it around for a long time? How did the Indians store things in the cold? How did they keep the cold in or out of their homes?

Book of World Records

Together explore insects in a field and find the biggest, smallest, the most . . ., etc.

Insect nets (optional), collecting bottles, string

Together prepare a Book of World Records. It can be pocket-sized. At the head of each blank page write in the words, "The Longest", "The Heaviest", etc. Create your own categories, elg., ugliest, funkiest . . .

Decide how to judge the contestants. Will you need rulers? Magnifying glasses? Watches?

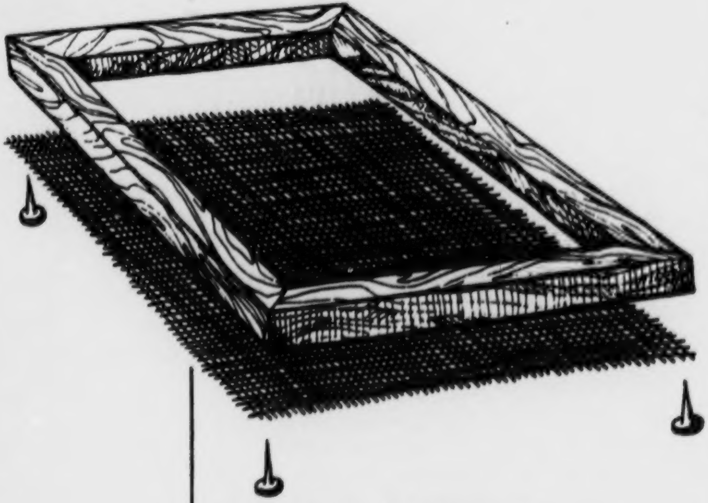
1. Explore a grassy field for candidates for your world records. Find animals or plants that are world record holders, enter information about them in your book. A sample entry would appear like this:

   The Tiniest Bug is Bert the Bug
   He was able to hide under a catepillar.

2. **The Great Creature Race.** Divide into teams of two. Instruct each group to catch the fastest creature around and hold onto it until the race begins. Use the string to make two circles: a small circle of 1 foot diameter and a large circle of 4 feet in diameter. When the signal is given, each team must release their animal in the middle circle. The first creature to cross the outer circle is the fastest animal in the world.

Make Your Own Paper

Together you can make your own paper and learn about recycling.



Wooden deckle (see illustration)
Discarded materials; old newsprint, corrugated cardboard boxes, used notebook paper
To be creative—bits of string, thread, colored paper, yarn, flowers, leaves
Water, egg beater
Liquid laundry starch
Several large desk blotters
Rolling pin
Large container

1. Tear the discarded paper—old newsprint, etc—into small pieces—no larger than 2 inches. Put the pieces into the large basin.

2. Mix the water and laundry starch to these proportions—1 tablespoon of starch to 1 cup of water. Add to the torn paper and beat with the egg beater until the pulp is a very light gravy.

3. Put the deckle into the pulp sideways until a light layer of pulp coats the screen completely.

4. Pull out the tacks holding the screen to the wooden frame and place the screen and sheet of wet pulp between the blotting papers.

5. Press out as much water as possible with your hands and then use the rolling pin. Let the wet pulp dry. You can iron it and use a photo dryer to make things go faster.

6. When dry, peel the paper from the blotter.

Make several sheets of paper using various materials. When dry, try writing or drawing on it using different kinds of pens—ballpoint, felt, ink. Try paints, pencils. Which sheet is the strongest; more water resistent; more absorbent?

These pieces of homemake paper are perfect as places to write your conversation notes or oath or some poem about nature. You can also press leaves or flowers into the paper as you are making it.

Litter Patrol

Together you can help to create a healthy community by picking up litter. Litter is an environmental problems that contributes to air, water and land pollution and adds to the cost of soil waste collection.

Form a litter patrol within your tribe using some or all of the group. Survey a local area for possible cleanup. You can do this on a Saturday with other people in your family or as a joint project with another tribe.

Bark Rubbings, Leaf Rubbings

Together you can make bark rubbings and use them as art pictures or compare them with different trees.

Crayons, black manila paper

Find a tree in your yard neighborhood with an interesting bark (or in the forest). Make a bark and leaf rubbing of it using the crayon and paper by rubbing the crayon over the paper against the tree bark or leaf.

Can you see how bark is like our skin and how it is different?

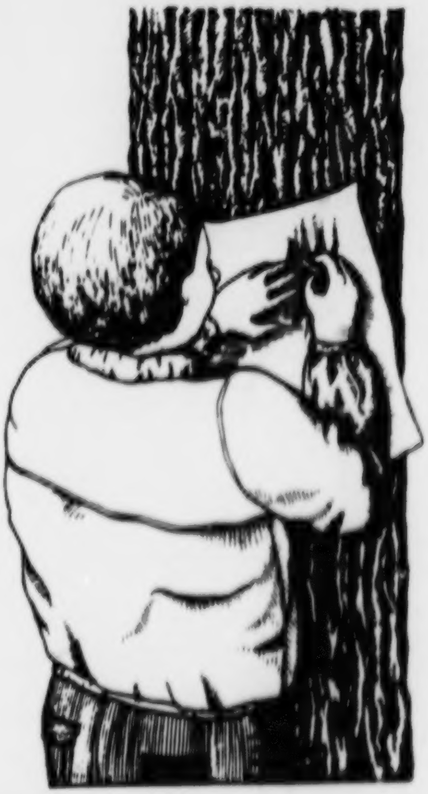
Extension:

Make a bulletin board of rubbings in your tribe.

Try and find out the names of your trees.

You can do leaf rubbings to make wrapping paper out of a roll of plain white paper.

You can use your rubbing to make a picture of the tree or to share with others. In a small area with a variety of trees, you can have a tribe meeting where everyone makes a rubbing. Then put them together and choosing a different one—can you find the tree?



Car Exhaust

Together you can explore your car's exhaust to learn about how much pollution cars cause.

White sock
Car

Join your child in finding out how much air pollution your car can cause. Put a white sock over exhaust pipe of your car. Turn engine on for two minutes and then turn it off. Pull the sock off carefully being sure not to burn yourself. Examine sock inside and out. What do you find? When you cross a busy street think about the pollution you breathe. (Do this activity outside in the fresh air!!) You can also very carefully hold a white napkin or handkerchief over the exhaust for a moment and examine it. Where does this come from, what is it, and where does it go?

Everybody Needs a Rock

Together you can develop your observation skills with a commonplace object.

Enough rocks for everyone. Choose a variety of sizes, surfaces (smooth, rough, sharp, pointed, etc.)
Blindfolds
Container for the rocks

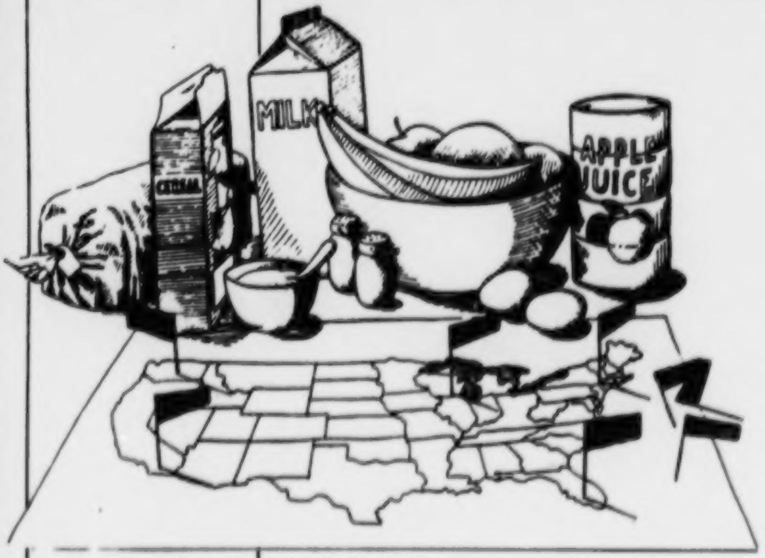
Sit in a circle—about 10-12 people. Pass the container of rocks around and let everyone choose their favorite. Ask them to study and learn all they can from it. Collect all the rocks back in the container.

Now pass out the blindfolds. (Don't let anyone know you will do this before you form the circle.) When everyone is blindfolded, pass the container of rocks around again and ask everyone to find the same rock they chose before. When everyone thinks they have theirs, remove the blindfolds and see how they did.

This is a good way to see that we rely greatly on our sight, and that there are other senses we can develop more fully.

Breakfast From Far Away

Together you can learn about energy by looking at all the different foods you eat to see how far they travel before they arrive on the breakfast table.



U.S. or world map, state map, packing boxes of breakfast foods, calculator (optional)

1. Lay out on a table all the foods that you would normally eat for breakfast. Spread the map out alongside.

2. Look at the labels on the packaging and divide them into two groups: Foods that come from your state and foods that come from elsewhere. Foods are generally packed and processed where they are grown, but not always.

3. On the U.S. map, make a mark to show every place that your breakfast came from.

4. Figuring that each kind of food travelled to you in a different truck or train, add up the total number of miles your breakfast has to travel to get to your house.

Extension:

The Indians got most of their food by hunting, gathering, or growing it within a few miles of their homes. Only rarely did they venture great distances to get food. Take a trip to the supermarket and buy only foods that were grown and packaged locally. It will probably be quite difficult to feed a household with only locally grown food, but it would be fun to try.

Discovery Walk

Together you can take a discovery hike that builds trust and teaches you to use all your senses while exploring the home.

Blindfold

Together decide you are going to be Indian scouts at night, a time when you must rely on many of your senses other than seeing to find out about the things around you. Make sure you both make a pact that you will always give the greatest care to the blindfolded person. Have one of you put the blindfold on (This works best if the child is blindfolded first, so they have an example to work from on leading a blind person.) Then lead the person by the hand into the different rooms of the house. Be careful in leading that you move slowly and help the blind person with gentle talking. Can they guess where you are by the sound or smell of the room? Does touching things help them know where they are? Once you have toured the house, change places and explore.

You can start outside in the garden with this. If you lead the person blindfolded to a specific bush or tree or plant, can they find it again when the blindfold is gone? Can you learn to identify the various bushes, plants and flowers in the garden by how they sound, feel, or smell? Can you tell where you are in the yard by the smell or sounds around you? The Indians had no books or charts to tell them what things were. They had to rely on their senses to identify things.

Waterclock

Together using materials around the home you can make a timer using water and use the timer at your meetings.

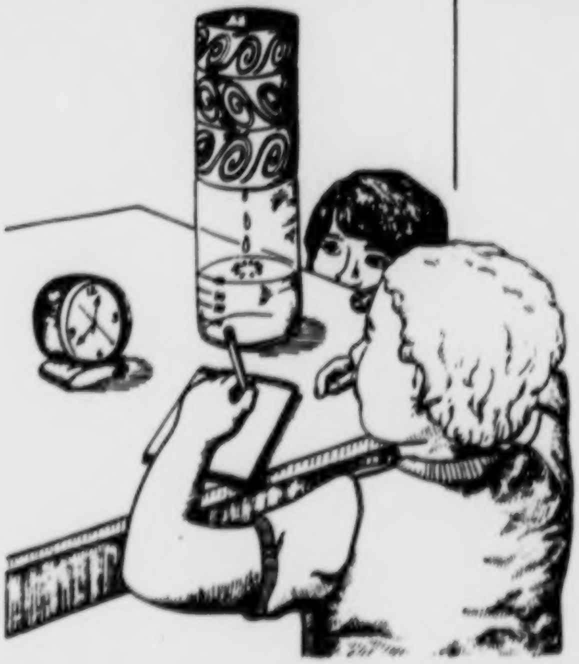
Tin can, jar, nail, marker that writes on a glass

Together fill a glass with water and drink from it. Then set about making your water watch. Take a can, and with the nail put a very small hole in the bottom, so that when the can is filled with water it drips. (The size of the hole needs to be very small. If the initial hole is too big, leave the nail in the hold.)

Place that can over a jar (we use the mason, pint or quart).

First you will need to fill the can and time how long it takes the jar to fill. After every 5 or 10 minutes, mark the jar. You can then use this as the official timekeeper at each meeting if the jar is big enough.

Now you can glue things on the outside of the can or paint it with the name of your tribe members.



A Bird in the Eye

Here are some birdwatching tips to help you learn more about birds.

Get a field identification guide. Your library has copies or you can find them in bookstores Some titles to look for: **The Audubon Society Field Guide to North American Birds** (Eastern and Western regions), **A Field Guide to Western [Eastern] Birds**, Roger Tony Peterson, **Birds of North America**, Golden Field Guide. Spend time at home becoming familiar with the guide.

Early morning is the best time for birdwatching. Mid-afternoon is worst.

Wear greens, browns, or other "quiet" colors.

Move slowly and stop when you spot something.

Avoid sudden movements such as pointing.

Try to answer these questions when you see a bird:

- How **big** is it? (Larger than a robin? Smaller than a sparrow?)
- What **shape** is its beak? Feet? Wings? Tail?
- What **color** is it? Any special markings?
- What **habitat** did you see it in?
- What is it **doing**? (Flying, hopping, pecking, etc.)

Do not worry if you do not know every bird the first time you see it. Even "expert" birdwatchers get fooled by simple birds. You will be surprised how much fun it can be to learn your local birds. Start with ones you know: robins, sparrows, jays, pigeons, mallards, crows, and go from there.

Window Garden

Together you can plant seeds from a variety of fruits and vegetables to see how important soil, water and light are to living things.

Egg cartons
Soil
Fruit and vegetable seeds

Together take seeds from apples, oranges, watermelons, cantalopes, grapefruit, tomatoes or other fruits and vegetables you may want to plant. Plant in sections of an egg carton which has been filled with soil. After you have planted the seeds, put the egg cartons on a window sill where there is plenty of light. Do you think the American Indian planted any of their vegetables inside their homes? Were their homes designed so there would be enough light for growing things?

School Projects in Environmental Education

A look at some of the outstanding and innovative programs taking place in schools throughout the Pacific Northwest

The following articles were written by teachers and students around the Pacific Northwest describing projects or activities in environmental education that are special. Special in the sense that they are innovative, unique, and successful in creating learning experiences that epitomise the best that environmental education has to offer; they are experiential, involving students in direct, hands-on activities that have a positive impact on their environment; they are self-directing (for the most part); they usually involve the surrounding community; and they provide the participants with the understanding that they can make a difference in their world.

Desert Ecology

Edmonds High School
Edmonds, Washington

Environmental education in western Washington deals mainly with the wet side of Ecology. Edmonds High School students have been making the trip to Sun Lakes State Park of Eastern Washington to enjoy the energy of the desert and dry out our curriculum.

Within the state partk is a group camp called Camp Delaney, which is located in the large basin below the rim of an ancient falls of the Columbia River. 400 foot high cliffs surround the basin which gives way to the erosion channel south to Soap Lake and Ephrata. The area is rich in waterways and abundant in wildlife.

Our program, which has been developing for almost ten years, includes first year biology students, advanced biology students, and a number of physics and chemistry students.

The first year biology students do a general desert ecology study in which teams investigate many segments of the desert biome. Topics include: animals of the desert, plants of the seablands, population densitites of plants and animals, soil and water data comparisons between eastern and western Washington, etc. Students are also encouraged to follow their own questions and observations as well as complete their group work. The first year students make presentations of their findings to their own group by using self-constructed graphics and oral presentations. Questions are encouraged and excellent discussion follows.

The advanced group program has evolved from personal research projects involving specific topics such as blackbird territoriality, fish species, plant life on table lands compared to the basin floor, night sounds, etc., to a group exploration of Northrup Canyon. The canyon is a box canyon which is located about 18 miles north of Camp Delaney, east of Steamboat Rock State Partk. While in the canyon our major activity is birding, but the entire group is alert to whatever natural events come our way. We have seen coyote and kits, rattlesnakes (many), bats, owl pellets, huge trout, deer, scorpions, beaver workings, numerous bird species, etc. The advanced classes also visit the Bird Lake Rhino Cast. The Cast was formed when a young Rhinoceros was overtaken by Pillow lava, forming a rather perfect mold which can be entered through a hole in the lower left leg by using a rope ladder and some courage. The cast is located above a ledge situated about 300 feet above Blue Lake.

The physics-chemistry students work the stars with their telescopes and are taken through Grand Coulee Dam on a super tour. The dam is about 35 miles to the north of Camp Delaney.

All students participate in early morning birding, hikes to the top of 400 foot Umatilla Rock, night hikes, owling expeditions, watching the resident Northern Harriers, a trip through the excellent Dry Falls Museum, learning about wood ticks and being energized by the ever present rattlesnakes. Student participation in athletic activities are carefully controlled to encourage the most in outdoor observation and awareness. Those who have seen the Virginia Rail, seen and heard the American Bittern, found nearly invisible Mourning Doves on the nest, seen owls feeding their fledglings, observed Norther Harriers passing rodents between them while on the wing have experienced the joy of nature. The value of such trips to our students and to our science program makes the effort worthwhile.

In the last two years, Rod McLeod and I from Edmonds High School and Mark Freed from Woodway High School, with supporting staff, have directed two back-to-back sessions involving about 75 students in each session. The program runs its first shift from Wednesday through Friday, and the second shift from Friday through Sunday. Special thanks go to Tony Angell of the Washington Office of Environmental Education, who introduced Rod McLeod and myself to the camp and its educational potential.

John H. Cooke
Science Department Chairman
Edmonds High School
Edmonds, Washington

Stream Ecology

Corvallis High School
Corvallis, Oregon

With the currently expanding interest in water quality and conservation, a unit on stream ecology is an appropriate part of many science courses. My primary concern is for my students to discover how the relationships between the living and non-living factors found in any stream are affecting or influencing the fragile nature of this particular kind of environment.

A pattern is apparent in the factors at work within a body of water, especially in the relationship of stream organisms to water quality. The major objectives of this unit are to determine those relationships by analyzing streambed conditions and water quality aspects for a prescribed length of stream (one quarter mile is a good length with which to begin); come up with suggestions for improvement; carry out rehabilitation projects based on those suggestions; and evaluate the effectiveness of the work previously done on another portion of the stream.

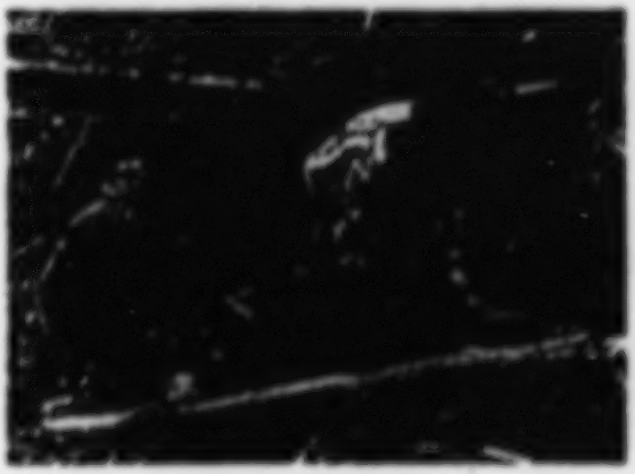
Prior to any work on the stream itself, a background must be solidly built and extensive training carried out with the students.

Any study of a stream must begin with a definition and discussion of the term "watershed." A good reference for student reading is "Understanding Watersheds" from an issue of Clearing. A student worksheet can be created to reinforce the material in this article. Using an overhead of a map outlining the watershed boundaries of your adopted stream and showing how the stream classification system works is also helpful.

Once the concept of a watershed is understood, an awareness of the significance of the riparian ecosystem and its influence upon stream conditions and wildlife is a logical progression. Several activities can be injected here to reinforce the concepts presented. Establishing the source of the food base or energy supply of the stream and revealing how this food is processed by the functional invertebrate groups illustrate one of the most important relationships of the entire stream ecosystem.

After these concepts have been established, training for the stream survey can begin. If there is a stream near your school, this is a good place to start. Using the *Investigating Your Environment Series: Water Investigation* from the United States Forest Service education packet, the students can be taught to test for water quality (dissolved oxygen, pH), water velocity, and other physical characteristics which may influence the stream. In addition, you can teach how to recognize riffles, pools, and instream structures and how they relate to fish-rearing habitat within the stream.

Once the training has been completed and the students are confident of their new skills, an actual survey of a stream can take place. A good way to do this is to divide the students into teams based on your observations of their expertise during the training time. Up to ten teams, depending upon the number of activities you decide to do, can be formed to conduct the survey. Each team is responsible for their data and for contributing it to the entire group's findings. Encouragement of data input and recommendations for rehabilitation of the stream section from all teams is very important.



Ideally, once all data is compiled, students will work together to discuss and formulate plans for stream improvement. An accurate photographic and map record of the stream section is extremely useful here. As a portion of the stream is projected onto the screen, discussion can be generated regarding the types of improvements needed to create the desired streambed condition.

A timeline for rehabilitation can be made once decisions and recommendations are made. A factor which must be considered here is how to complete any planned rehabilitation before the fall and winter rains begin. High water prevents further instream work, yet helps the improvements to become effective. As stream improvements begin to succeed (showing development of rearing habitat), the class may want to begin a hatchbox program to re-establish prescribed fish populations within the stream.

Important assistance with projects of this type can be obtained from many sources. The Oregon Department of Fish and Wildlife (through the Salmon-Trout Enhancement Program [S.T.E.P.] or the Riparian Management Program), the United States Forest Service, and local groups such as the Izaak Walton League or Northwest Steelheaders may be willing to help either in an advisory capacity or possibly a financial one. Their input is very valuable and they are usually most eager to help. Any instream work must have approval from the ODFW, and the regional S.T.E.P. biologist must be involved in stream selection and/or hatchbox activities.

This unit is lengthy. The actual classroom and training background work may take three weeks or more. Actual stream work will need to be planned for weekends or when there is ample time to accomplish your particular objectives. A basic factor to be considered is that it will take many times more hours to train than to actually conduct the survey. A half day would generally be sufficient to complete a quarter mile stream section survey with students. Depending upon the amount of rehabilitation necessary, the improvements could take several full days. Regardless of the amount of time it takes to teach the unit, extensive and careful preparation by the instructor is essential to insure success and a smooth transition from one activity to another.

This project is exciting and rewarding. Three to four years of continuous work on the same stream can generate vast amounts of data which will be extremely valuable for possible use by state agencies or your future students. The kids enjoy getting out, doing actual field data collection, and knowing they are contributing something worthwhile to the environment. Probably the most exciting thing about this work is, with evaluation of previous classes' rehabilitation projects, the students will know what they are doing really works. In addition, working with the cooperation of other agencies exhibits to the students how valuable coordinated efforts within the community can be.

If anyone is interested in conducting a project of this type, several suggestions and a bibliography are available. Examples of the activities and some of the background information may be printed some time in the future in the *Water, Water Everywhere* curriculum project.

Patty Farthing
Field Studies in Natural History
Corvallis High School

Dogfish Creek: Teaching Science Through Community Projects

North Kitsap High School
Poulsbo, Washington

As a science educator I find the two most difficult aspects of our profession to be (1) the lack of feedback of our student success in using the knowledge learned, and (2) providing 42 weeks of worthwhile, hands on lessons. I believe most educators would agree that during the school year our "families" increase by 30+ children. This assumed level of responsibility often prompts fears that we may not be delivering a valuable education to all.

Over the last couple of years I have felt a need to provide community projects to my students which reinforce key scientific concepts that I had been teaching and which promote the idea, that these students can make a difference in the quality of their community. To answer these needs I have introduced my high school students to the idea of completing an enjoyable and valuable project for part of the course requirements. Due dates were assigned for project selection, identifying key problems and steps, developing a time line, and project completion. Throughout the quarter I offer and introduce quite a selection of projects to be completed independently or in teams.

Several of these projects have centered around our restoration of a local creek, Dogfish Creek, which empties into Liberty Bay. Dogfish Creek was convenient because most of its watershed is within walking distance or a short drive from school.

To better understand the process of stream and salmon enhancement and the curriculum to be taught I completed a course offered by a county extension office. The course was a Saturday well spent, providing a wealth of information.

Our initial class projects included:

1. stream mapping (substrate, habitats, blockages, etc.)
2. water quality (testing)
3. determining baseline line information (flow rate, coliform, etc.)
4. contacting interested organizations (Trouts Unlimited, Soil Conservation Dist., Dept. of Fisheries, Indian Tribes, City Government, Boy Scouts, etc.)
5. formed a cooperative with monthly meetings
6. newspaper releases and interviews
7. produced and distributed a brochure to increase community awareness to our problems and possible solutions
8. clearing blockages
9. grant applications
10. salmon egg boxes and rearing pond installed
11. farmland fencing applied for and installed
12. streamside tree propogation and planting
13. estuary infauna biomass study
14. christmas tree-herring spawn project
15. research of agencies for supportive information: Dept. of Health Services—coliform counts; Dept. of Fisheries—escapement counts; Dept. of Ecology—non-specific pollution
16. food chain diagrams
17. hatchery work

It has been my experience that many of my students need physical involvement to understand and remember science concepts. Student success causes me to understand how much of the factual information we present can actually be utilized or applied by our students without this type of student involvement. The projects themselves also add another dimension to the satisfaction I receive as an educator.

There are many environmental problems available besides stream enhancement that can be used as a vehicle to promote thinking skills, scientific enquiry, experimentation, research, science concepts, and individual worth.

After a project has been selected, seek advice and support from organizations. I have been amazed at the availability of information, labor, funding, and resources once things are initiated. Provide regular 5-15 minute class discussions and meetings that allow the students to determine direction and share progress reports.

Looking back over the last three years of our Dogfish Creek project I am surprised at the number of our successes and at the amount of work completed. As a fringe benefit of all of that education, we have contributed approximately a million salmon to the fishery resource! Evidence is mounting that my students will be taking with them an education that works. You can accomplish the same by taking one small step at a time, in an atmosphere of excitement!

Darryl Elves
North Kitsap High School

Barn Owl Nesting Box Project

Sunset High School Earth People
Beaverton, Oregon

In the fall of 1980, Earth People, the environmental club at Sunset High School headed by Advisor Janet Hogue and its 18-member group, began an on-going Barn Owl (Tyto Alba) Project to determine the size and stability of the barn owl population in the suburban and semi-rural community of Beaverton. The group, interested also in the possibility of managing the birds by providing nesting sites, hoped to maintain the owls in the area and thus control the rodent population.

Continuing the project today, members of the club contribute time and scrapwood to construct nesting boxes measuring 24 x 24 x 18 inches. An opening is left on one side to serve as an entrance, and the boxes are padded with hay before being placed high on the walls of the 50 to 100-year-old barns near openings or corners. The students check and clean the boxes monthly recording any observations each time.

The man-made habitats are placed within a five-mile radius of Sunset High School making for easy accessibility by the club. The nine locations, ranging from barns to a fir tree, provide excellent possibilities for accurate observation.

Results

Our research began in September, 1980 and has continued to date. The data included in this report runs from 1980 to 1985 and includes only the school year (September through June). A total of nine barns were involved in the beginning of the project, but there are only seven now. One barn has been torn down, and we decided to discontinue research in another owing to unfortunate circumstances. The brief data gained from these two barns is included.

In this five year period, a total of forty-eight Barn Owls have been sighted in the barns or in their vicinities. This

number may fall short of the real number of owls in our area of research, due to the fact that the barns were only visited a few times a year. To keep a truly accurate record, we would have needed someone to keep a constant watch and count of the number of owls that actually inhabit the barns. In 1980-81 there were 20 owls sighted, in 81-82 there were 13, in 82-83 there were 6, in 83-84 there were 7, and in 84-85 there were 4. This brings the average to 9.6 owls sighted per year, but this number doesn't show the definite decrease in sightings per year. The difference may be due to inconsistent visit habits by our members, bad timing, or to an actual decrease in population.

All of the boxes in the barns seem to be consistently nested. There have been only three incidents where a box hadn't been nested in a given year. One of these incidents may have been due to disruption of a nest by our group during our research. Presence of pellets, guano, feathers and prey can almost always be noted in or around the boxes.

The reproduction of offspring of the Barn Owls has been very prolific as well as successful. A total of sixty-nine eggs were laid in the five year period. Of these, seven were infertile or found cold. Two nests had been abandoned, and the eggs left were transplanted to another nest where a female was incubating only one egg. This attempt to save the abandoned eggs was unsuccessful. Thus sixty-two of the eggs that had been laid wree hatched (89.9%). Of these young, fifty-eight survived (93.6%). The young owls after two or three weeks of age, were all banded with bands from the Wildlife Department.

Although the number of owl sightings decreased, the nesting signs of Barn Owls have remained in all the boxes. Also, the reproduction of offspring has been at a very high as well as stable rate. This shows that the Barn Owl population in our area, although it may not be growing, is marked by stability.

Lee Hartman
Paige Dunning
Steven Schuback
Sunset High School Students

Endangered Species: Creative Energy for the Environment

Fairview Junior High School
Silverdale, Washington

Creativity, cooperation, research and caring are essential parts of any effective plan to preserve the habitats and lives of plant and animal wildlife. A class of gifted students from Fairview Junior High (Central Kitsap School District) used those skills to brainstorm long range solutions to the problem of wildlife extinction. Possible solutions they designed included:

—animal cryogenic centers
—plant and animal colonies on other planets (or the reverse, human space colonies to reduce overpopulation and environmental demands)
—biosphere reserves on land-grant college campuses for research and protection
—transportation systems featuring air cruisers that do not pollute or destroy habitat
—habitat bubbles that protect against pollution and poachers
—required curriculums for grades K-12 entitled "Whose Planet Is This?"
—laws requiring villages of a certain population to maintain biospheres if they want federal funding for projects

These junior high students participate annually in a nationally sponsored academic competition called "Future Problem Solving." They divide into teams of four students each to analyze scenarios written by futurists. The scenario regarding endangered plant and animal species was set in the year 2000. It described projected statistics on worldwide extinction rates, geographic regions in particular danger and successes/failures of the U.S. Endangered Species Act. After reading/discussing the scenarios, students follow a problem-solving model established by E. Paul Torrence from the University of Georgia.

The first step in the model is to brainstorm all the possible international problems that could arise from current habitat problems facing plants and animals. To prepare for this step, hours of research are necessary! The school and local libraries were consulted for books, news articles, journals, filmstrips, etc. Several students visited the zoo, read about endangered animals there and asked the employees questions. T.V. shows, such as *Nova* and *National Geographic* Specials were discussed. Relevant current news events were discussed on a daily basis. The highlight in preparing the students for brainstorming their problems was the visit of a local and well known artist, Mr. Tony Angell. He showed them slides and drawings of his artwork, which includes sketches and sculpture. He left the students with beautiful posters of native flowers and whales.

The student teams brainstormed all the possible problems that they could. They tried to consider all segments of society. Ideally, each problem had to be substantiated by research and written into a concise, clear manner. In the next step, students decide what the major underlying problem is. In many teams, the destruction of habitat surfaced as the key problem to be solved.

Step Three, is generation of solutions. As with the projected problems, all solutions must have an origin in research. Creativity is encouraged as well as clearly communicated and elaborated solutions. The more segments of society they involve in their solutions, the better!

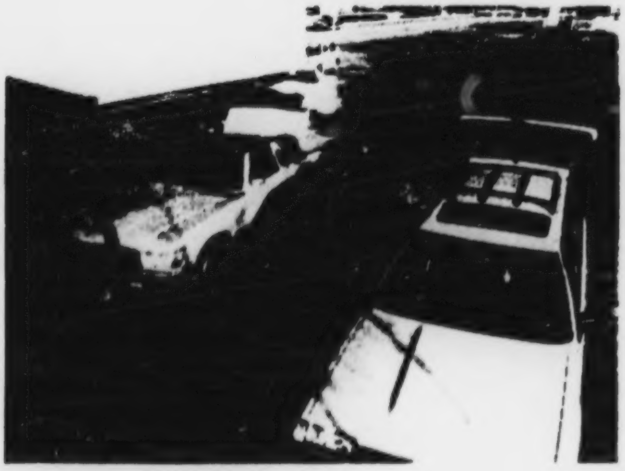
The written record of all phases of the problem solving process are sent to judges trained for the nation "Future Problem Solving Competition." The judges' written and taped feedback is sent back to each student team with suggestions and reactions to their ideas and content.

Before digging into this unit, the students spent lots of time working on team process. Gene Stanford's book *Developing Effective Classroom Groups* is an excellent resource for this. Steps that build toward creativity are also studied and practiced by all the students. An excellent reference book for this is the *Creative Actionbook* by Noller, Parnes and Biondi. Both books are step-by-step classroom guides with lots of activities for building specific skills.

Unit follow-up activities are focused on local events. The students collected money and adopted an endangered animal (The Humboldt Penguin) at the Seattle Woodland Park Zoo in Tony Angell's honor. One student has polished up her animal drawings to send to Tony Angell. Local wildlife shelters have been contacted to find out what their immediate needs are so that assistance can be offered during the warm weather months.

Student comments can be summarized by these quotes: "I feel so much more aware and concerned about wildlife rights" and "It's a big problem. But solutions are possible if we are creative and work together!"

Maura Broderick
Fairview Junior High
Central Kitsap School District
Silverdale, WA 98383



Community Recycling Project

Mercer Island High School
Mercer Island, Washington

The Mercer Island, Washington Recycling Center, run by students of Mercer Island High School, earns about $30,000 a year. The Center, managed by students who have organized themselves into an environmental conservation group named the Committee To Save The Earth, "offers steady employment to hundreds of students," says the club's advisor, Social Studies teacher Jerry Sussman. "We support all school clubs," said Sussman, giving the basketball team, for example, the opportunity to earn money for a tournament trip to Hawaii. $8,000 of the club's earnings are budgeted for projects, which in the past have included a float trip down the Skagit River to observe wintering eagles, an annual camp out in the San Juan Islands and working with the University of Washington on a trout enhancement project for Lake Washington. This year Sussman and Mercer Island's student recyclers are considering establishing an Environmental Studies scholarship at the University of Washington. Later this year they will sponsor a public affairs forum at the high school, bringing in experts to discuss how serious environmental, labor and international disputes can be resolved through negotiation.

The Mercer Island District's recycling efforts began in the late 60s with work by junior high students under the direction of teacher Harry Leavitt. As these students moved into high school their recycling project picked up momentum and community support. The school district provided land for facilities, an architect donated his design services ("We have a designer recycling center," quips Sussman) and local service clubs, churches and businesses contributed labor and materials. The center was finished in 1975. At theat time "the environmental movement was very strong," Sussman recalls. "Many young people were devoted to the idea of living more simply, of stopping wastefulness. We had many volunteers." Although times have changed, Sussman says he has never lacked a dedicated group of very capable students to help manage the recycling effort.

Also essential for success, Sussman says, are continuing donations of recyclables, school and community support and high standards of center maintenance. Last year the center was given a Community Asset Award by the Mercer Island City Council.

Other Seattle-area schools that have followed Mercer Island's lead into recycling are Our Lady of the Lake School, the Northwest School and the Edmonds School District, which this year, under the direction of consultant Pandora Touart, began an ambitious paper reclamation program. In addition, the Washington Department of Ecology's A-Way With Waste program continues to offer workshops for teachers interested in reducing waste and in getting started in school recycling. For more information write: Washington Department of Ecology, 4350 150th Ave. N.E., Redmond, WA 98052, telephone (206) 885-1900.

With school budgets tight, with landfill leachate tied to groundwater contamination, with the cost of waste disposal rising sharply with new state regulations stressing reduction and recycling, the time is right for more wide spread, and school, recycling.

Todd Peterson
Education Specialist
Washington Department of Ecology

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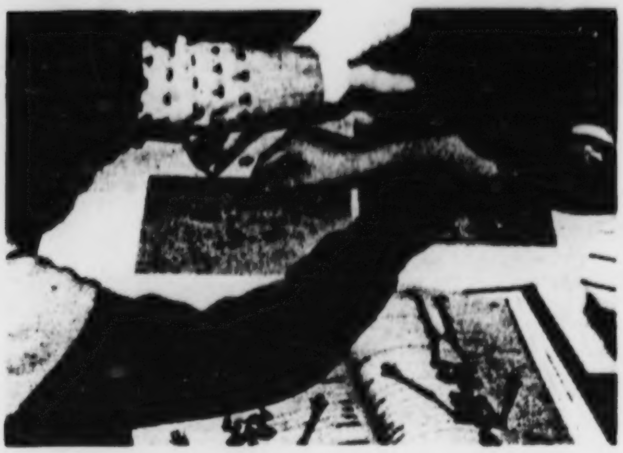


Project WILD

Shasta Elementary School
Klamath Falls, Oregon

A very small article in the local newspaper caught our eye and started us on a very exciting adventure. The article offered a Project Wild Workshop to educators and was held in the Tulelake National Wildlife Refuge Headquarters. With only two, three hour sessions, it seemed like an excellent opportunity to learn more about Klamath Basin wildlife and how we could share this with our elementary students.

Project WILD is sponsored by the Western Regional Environmental Council, an organization representing state level education and natural resource agencies from 19 states, and the Western Association of Fish and Wildlife Agencies. Steve Andrews, Project Wild coordinator for the Oregon Department of Fish and Wildlife, coordinated the workshop and provided literature about Oregon's wildlife as well as films, animal pelts, and other materials. Two Project WILD activity guides, one for elementary children and another for secondary students, were provided free of charge. They contained about 80 activities developed jointly by classroom teachers and wildlife experts that were field tested for two years.

Our first meeting found all in attendance very enthused and delighted with the material presented both verbally and visually. Our Project Wild Activity guide book offered a challenge to go right back to the classroom and get busy exciting the children.

As the first session drew to a close, a set of owl pellets were offered to anyone who wished to use them and report back at the next meeting. Quickly we volunteered to explore the possibilities of this wildlife item.

We teach second and fifth grade students. Over the years we have shared lessons between these two age groups, so we were especially excited to have the opportunity to see what second and fifth graders would do with this type of cooperative project. The fifth graders were divided into groups of two or three students. The second graders were assigned to a group and everyone set to work taking apart the owl pellets to see what the owls had eaten. The bones were rearranged using knowledge from the study of small animal anatomy and available textbook illustrations of a human skeleton (the comparison is amazing). While the children were busy working one teacher took polaroid pictures of their progress.

When the skeletons were assembled, the pictures mounted and the names of those involved recorded, they were taken to the IMC center. These projects were displayed for the entire school to examine and enjoy. (Which they did, judging from the interest shown and comments overheard by the librarian.)

When Project Coordinator Steve Andrews asked us to prepare an article for the Clearing Magazine, he felt black and white photos would be necessary to illustrate this lesson. Glenn Ardt, Manager of Miller Island Refuge, came to Shasta School to take the pictures. To vary the pictures, we used some additional owl pellets with six children (from both grade level) who missed the previous exciting lesson. As the children worked for themselves and the photographer, the fun and adventure of discovery of what an owl pellet contained started all over again. What a wonderful project to get children thinking about wildlife and its place in our environment.

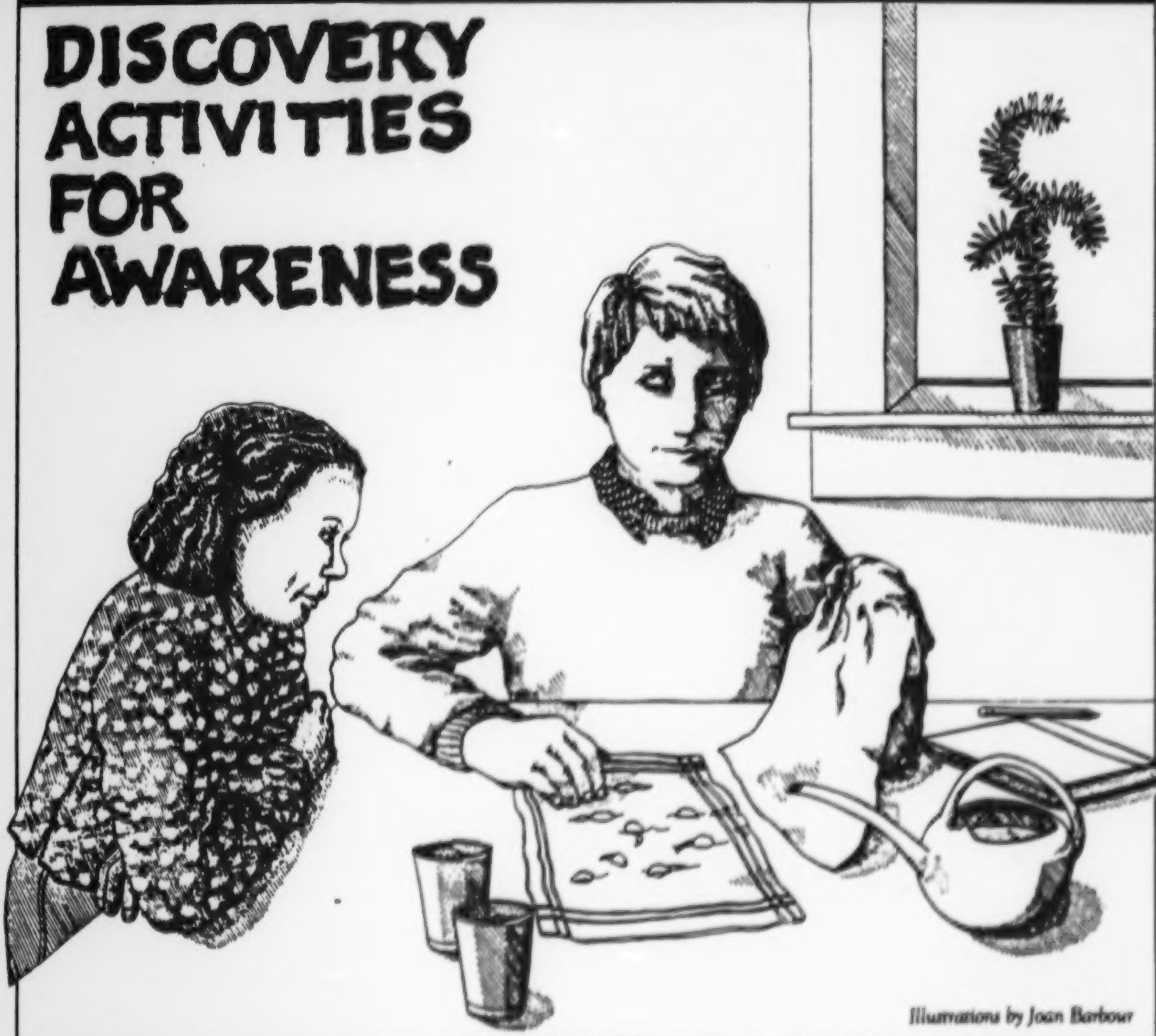
Frances Gearhard
Fifth Grade Teacher
Shasta School
Klamath Falls, Oregon

Dorothy Winters
Second Grade
Shasta School

Clearing would like to continue to recognize outstanding and innovative school environmental education activities or projects such as the ones presented here in future issues. If you currently are involved in a unique program that you would like to share with others, please call or write to Clearing, c/o the Environmental Education Project, P.O. Box 751, Portland, OR 97207 (503) 229-4721 or call the EEAO toll-free hotline within the state of Oregon 1-800-322-3326 and tell us about your project. If you are aware of a project in another school, we would be very happy to hear about them, too.

Clearing believes that by sharing information on projects and activities throughout the Pacific Northwest that are truly exemplary, we can encourage the development of similar projects by giving people the information to get started. Or at least let them know that there are other people in the region doing special things, and that in spite of obstacles and hurdles, they are worth the effort.

DISCOVERY ACTIVITIES FOR AWARENESS



Illustrations by Joan Barbour

Together you can learn about the food we eat by taking different seeds and sprouting them to watch them grow.

Window Garden Plans 1

window garden plans 1

With your child pick out a variety of different seeds to grow. Many foods in the home are really seeds of a plant. You can use dried sunflowers, corn, peas, lentils or any dry seeds you have in the home. Place the seed in a moist towel; layering the seeds so they can be surrounded by moist toweling. Make sure the toweling stays wet, check the moisture everyday and watch for the beginning of roots on the seeds. Once the seeds have sprouted, they need more nutrition. Place dirt in a cup and then plant your sprouted seed, covering the seed with about ¼ inch of soil. Place the cup in the window. Make sure the cup has a hole in the bottom for drainage of H2O. Water your seeds everyday. Record when your seed first sprouted roots and when you planted it and when it pokes up through the soil. Do different seeds sprout at different times? Why does one need to plant seeds in the soil? Do all the seeds sprout? If not, why?

What would happen to this plant if you put a cardboard box over it for a week?

What would happen if you watered this plant four times a day—or not at all?

Woutld it make a difference in our way of living if all the green plants died tomorrow?

How is this plant nourished?

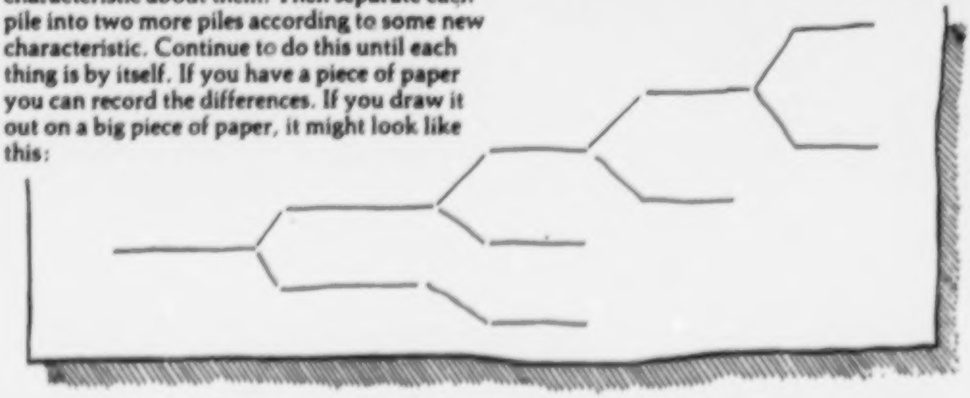
Leaf Classification

Together you can learn about similarities and differences in nature by classifying natural objects.

Rock, leaves, or other natural objects

Together decide that you are going to explore the similarities and differences in nature. You will need a collection of 5-10 different types of stone, twig, or leaf. Take all your objects and split them into two piles according to some characteristic about them. Then separate each pile into two more piles according to some new characteristic. Continue to do this until each thing is by itself. If you have a piece of paper you can record the differences. If you draw it out on a big piece of paper, it might look like this:

Now you can put all your objects back into a pile. (This is your key. It is very much like the one you will find in any bird or plant book.) Take one object and see if you can find out where it belongs in the key. Were you right? Was it easy or hard? If you use a new object, will it fit your key or will you need to change it?

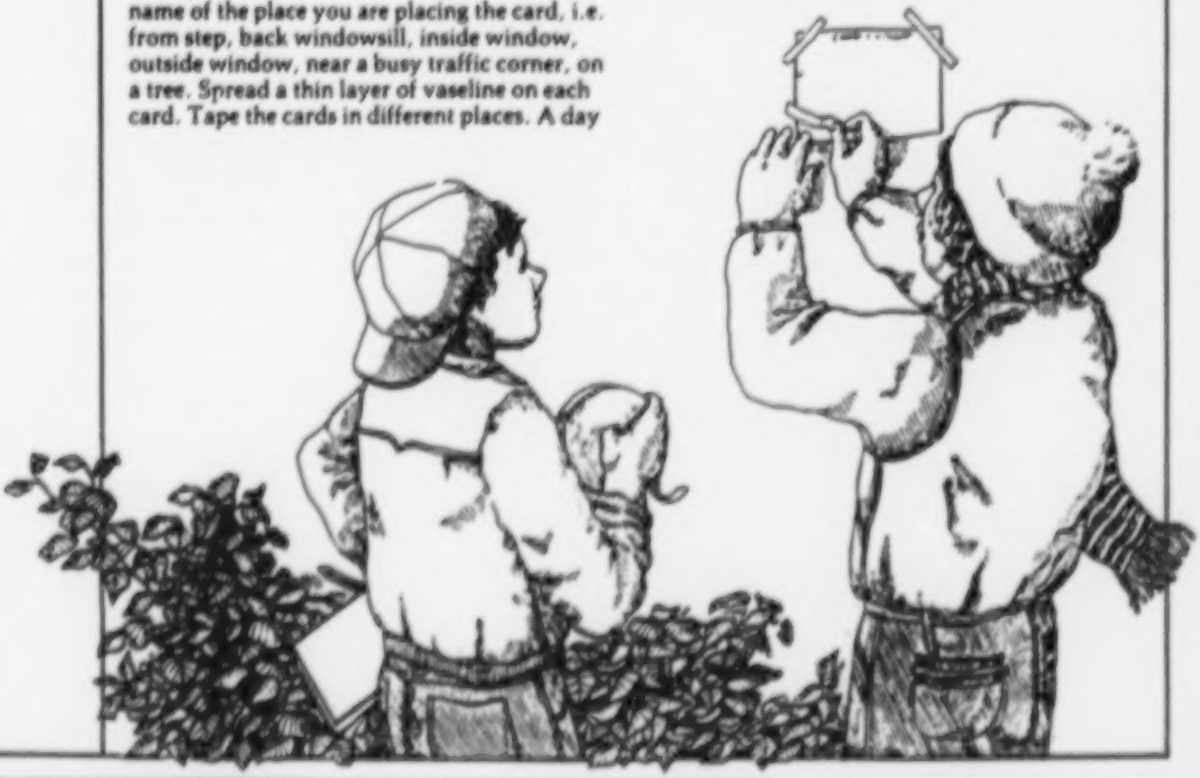


Catching Pollution

Together, explore you community to learn how much pollution (air) there is in a variety of places. (Pollution spoils the environment.)

Vaseline
White cards
Masking tape

Join your child and label each card with the name of the place you are placing the card, i.e. from step, back windowsill, inside window, outside window, near a busy traffic corner, on a tree. Spread a thin layer of vaseline on each card. Tape the cards in different places. A day later collect the cards. Each card is a record of one day's air pollution in that area. Where does all this come from? Where does it go? Is this why our Houses need to be repainted so often?



Sound Symphony

Together you can listen to the symphony of sound in your house to help you become more aware of how sounds can affect an environment.

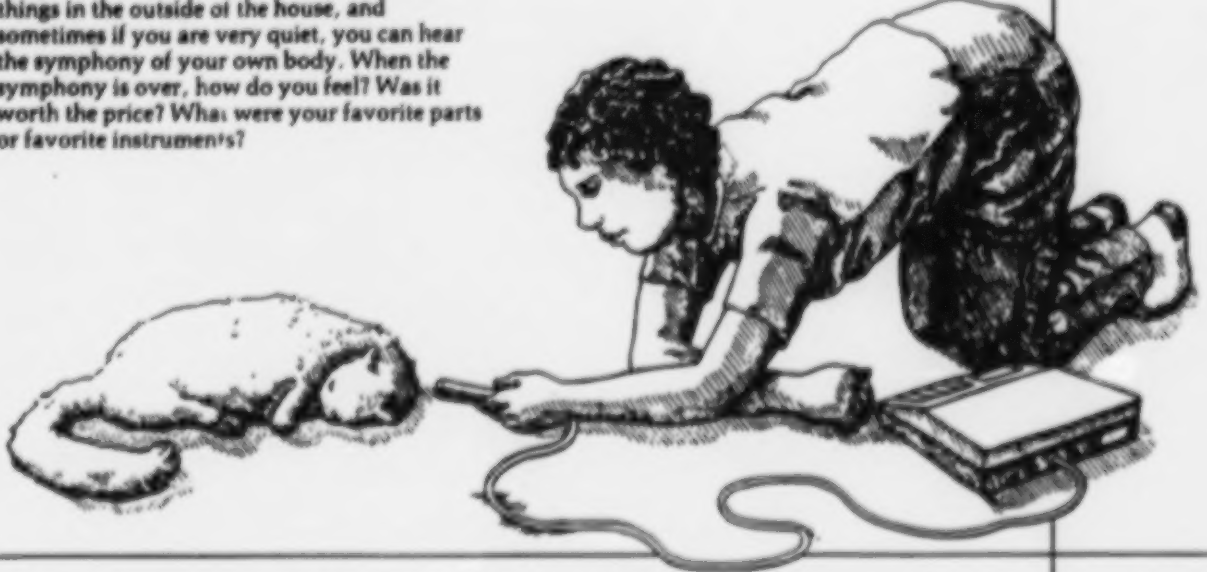
Ears:

Indians were very much in tune with the sounds around them. Listening to sounds was a way of learning about what was happening in the village or in nature around them. Decide upon a place to sit in the house together and listen to your own symphony, for about 5-10 minutes use a watch or water clock as a timer. Can you tell what is going on around you? (Try to be quiet during the performance or the usher may ash you to leave.) Besides, if we make our own noise symphony, we can't hear the symphony of life around us. You will hear things in the outside of the house, and sometimes if you are very quiet, you can hear the symphony of your own body. When the symphony is over, how do you feel? Was it worth the price? What were your favorite parts or favorite instruments?

Extensions:

1. You can make your own symphony using natural objects around the house. Together play one for your family or tribe. Can you describe an activity or place in the house through your symphony?

2. You can also tape record familiar sounds in the house, like a mixer, light switch, door closing, timer, toilet flushing. Play it at the next tribe meeting to see if everyone can guess what the things are.



Bugs are Cool

Together you can explore bugs to learn about their role in your community.

Small bottles or jars (clear), magnifying glasses

Insects are fascinating to study. They re colorful, strange, and tiny. Here are some things to do with them.

1. Insects are everywhere. Under leaves, on the ground, flying through the air. More than half the fun is chasing after and catching them.

2. Select a few that you'd like to learn more about. Put them in a glass jar and place it in the refrigerator or freeser FOR NO LONGER THAN 10-20 MINUTES. You will not hurt the animals by cooling them down. This just slows them down enough so you can study them. You'll know they're ready as soon as they stop moving.

3. Place them on a white tray or sheet of paper in a well lit area. With your magnifying glasses, try to answer these questions:

- How many wings do they have? (Most have four but sometimes two of them are hidden.)
- How many legs do they have? (Insects—6; Spiders—8)
- How many sections to their bodies? (Insects—3; Spiders—2)
- Do they have antennae?
- What do their mouthparts look like?
- How many eyes do they have (Some spiders have up to 10!)

1. Make a bug village for a day. Put some rocks, leaves, or twigs in a jar for the insects to climb on. Let them go at the end of the day.

2. For each insect you find can you tell what role it plays in your community? Where does it get its food and nourishment? Where does it live? Is it helpful to us or do we consider it a pest?

You can play charades together by acting out insects or bugs and see if you can guess what you are acting out.

EARTH WISDOM

by Steve Van Matre

We travel through the voids of space on a small, self-contained life vessel powered by the energy of the stars. It is a marvelous ship of life, probably one of the most wondrous and rare in the universe. Yet in our human-centered ignorance and arrogance we have tried to create a different world, to create an existence separate from our fellow passengers, to confine the other species that share the vessel with us to smaller and smaller compartments while we command more and more space for our burgeoning numbers and desires.

The earth is in danger of becoming a monstrous slave ship sailing on the cosmic tides of the Milky Way. To support our continually expanding population of human passengers we are systematically destroying or enslaving much of the other life of the ship we sail upon. And we have used the fossil sunlight and water discovered in various holds of the ship to support artificial compartments where a relatively small number of us live in amazing luxury. In fact, compared to the majority of the ship's human passengers most of us in western society live in these synthetic, unnatural settings like swollen grubs feeding off of the energy-rich micro-environments we have created, all the while spewing forth our resulting disorder and poisonous wastes to contaminate other areas of the vessel.

It gets worse. As elite passengers, we are also creating a culture based upon "synathetics" where acceptance and beauty is often determined by the amount of fossil energy invested, and our actions have set this energy-rich fantasy as the standard for the world. It is said that Disney's new EPCOT Center may become the premier tourist attraction on earth. If so, all who enter should be forewarned to skip Future World. This highly polished, stainless steel and plasticized spectacle is not what it claims to be. It is the Environmental Propaganda Center of Tomorrow, and that vision of the future is hazardous to the health of our planet. Tragically, such a portrayol could have been predicted, for our high-energy addiction has blinded us, stunting our growth, causing us to turn inward, losing sight of the realities of our life here. Most of us don't see the earth as it really is. We have lived too long in our energy-rich urban colonies. We react in amazement when told that there are more sharks here than people, for we have come to see the earth as people and cities and highways and hotels—a continually growing progression of synthetic attractions.

"We are all too often led by the environmentally illiterate and served by the educationally disinterested."

Cousteau suggested that "gigantism" was a primary factor in the decline of the civilization on Easter Island, for in the midst of widespread deprivation and starvation the islanders were still tying up significant resources in carving colossal ancestor statues out of the mountain rock. It was as if they couldn't control the system they had created. Their religious and social stratification had actually imprisoned them, trapping them in a system that continued turning out gargantuan products on one end and even when the other end had no base of support left—no food, no fuel, no stamina for the continued growth expected. So what does Cousteau's story have to do with us today? Are not our modern skyscrapers our present statues, in this case gigantic phallic symbols thrust above our skylines, proclaiming our conquest of the earth even as most of our species continues to struggle for survival? Is not our contemporary view of progress and growth just as distorted as that of those islanders centuries ago? People should not spend their entire lives in a skyscrapered city, for in the midst of those artificial canyons they will likely forget who and where they are. If people are stopped on the street of a major city today and asked what supports the life of the earth, they will probably reply that their city does. Isn't it strange that people can name the trees along the sidewalk but don't understand how sunlight supports the life of earth? Perhaps we have entrusted an understanding of our planet and its problems to the wrong people: to those who spend their time primarily inventorying the natural world, to those who pass out freeze-dried frogs at the science teachers' conventions, to those who claim that trees cause pollution. In fact, those who explain the workings of earth best sound more like poets than teachers. Perhaps we should hire the poets instead of the biologists to write our science textbooks! Undoubtedly, we must simplify our messages and express them in ways that assure more lasting effects.

"If people are stopped on the street of a major city today and asked what supports the life of the earth, they will probably reply that their city does."

A state department of conservation in the Midwest conducted a survey on how people liked to get in touch with nature, and to their surprise the overwhelming majority said they liked nature best on television! And why not? Many who attend our live nature programs yearn for M and M's (magic and meaning) and get N and N's (names and numbers) instead. Is it any wonder then that they turn to something that can simplify and dramatize the object of their interest? A story making the rounds a few years ago illustrates the point. Two people were given the same task—to explain some essential understandings about astronomy to a university class. One was an actor, the other an astronomer. And which class do you suppose retained the points longer and rated the experience as the more enjoyable? Score one for good communication. What a strange dilemma we face. The leaders of our countries often appear to have little or no real understanding of how life functions here, while the leaders of programs that might redress the problem frequently appear to be hobbyists instead of educators. We are all too often led by the environmentally illiterate and served by the educationally disinterested. This is not to ignore the many real and significant contributions made daily by a host of those laboring in this field, often with little or no support, but overall it has obviously not been enough. And many have gone astray. We urgently need to refocus. We must cut through the natural history recitations and start helping people understand the big picture ecological concepts, what these understandings mean for their own lives, and how we must all begin to change our lifestyles in order to live more harmoniously with the earth.

The unnatural world we have created here is surely doomed. As the ship's stores of fossil fuel and water are depleted, our fungus-like, energy-bloated urban colonies will shrink and wither. People will return to the land to create more labor-intensive, decentralized lifestyles. To prepare for the future we should study the past, relearn (and improve upon while we can) ways of living on minimal amounts of fossil fuel and water. Now is the time to get ready. We should seek out those who have demonstrated a wisdom nurtured by close contact with the earth and listen to their words. Such people know that genuine wisdom lies not in understanding but in caring about what you understand. A skilled man can build a skyscraper, but only a wise man can help us judge how best to use those skills.

Imagine for a moment that you are sitting right now in an intergalactic council meeting listening to a speaker describe a ship with which they have made radio contact in a remote galaxy called the Milky Way:

"Fellow council members, we have been in touch with this life vessel for over a month now and during that time we have been informed about the following conditions: First, over fifteen million of this ship's human passengers are dying each year of starvation and nutrition-related disease; second, some environmental scientists on board report that the human life on this ship is also destroying other kinds of life, their fellow passengers, at the rate of one species per day; third, tens of thousands of the human passengers die each day of environmentally induced stress and disease; fourth, the life support systems on board have been severely disrupted by the introduction of vast quantities of synthetically produced substances which now threaten the well-being of large numbers of passengers; fifth, armed conflict claims the lives of millions each year as the human passengers fight among themselves to maintain control over the dwindling food and fuel supplies on board."

Is there any doubt that as a member of such a council meeting you would conclude that "that ship is in trouble"? You would be right. It is. Perhaps the problem is not that we didn't work well enough together, but that we worked too well. In fact, maybe if we hadn't worked so well together, we wouldn't be destroying the earth so rapidly. For the future, perhaps our motto should become: love the earth first and its people second. Or as Rolf Edberg put it: "What has gone wrong, probably, is that we have failed to see ourselves as part of a large and indivisible whole . . . we have failed to understand that the earth does not belong to us, but we to the earth."

Steve Van Matre

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Part Two

School Projects in Environmental Education

A look at some of the outstanding and innovative programs taking place in schools throughout the Pacific Northwest

This is part two of what we hope will become a regular feature of Clearing: descriptions of outstanding and innovative environmental education projects or programs that are taking place in schools all around the Pacific Northwest. We are finding that there are many such projects, but they are rarely noticed nor do they receive the recognition they deserve. By highlighting these efforts, we hope to give encouragement and motivation to others who would like to start projects of their own, and offer insights into the best of environmental education in the Pacific Northwest.

A True Thanksgiving

Caulfield School
Vancouver, British Columbia

Each fall, in the week before the Canadian Thanksgiving, I take my grade five and six class at Caulfield School in Vancouver, B.C., plus any of the parents that wish to come along to a remote homestead on one of the Gulf Islands to take part in an old fashioned Thanksgiving celebration. The homestead is on a prime waterfront property and has a large multibedroom home with a woodstove and hot and cold running water. I find the bedrooms and hot and cold water are great inducements to the parent helpers although the children stay outside. The property is privately owned by a friend and he has incorporated a society that leases the property for selected environmental pursuits. It is called the Society for Outdoor Studies and has assisted hundreds of children, mainly from southern Vancouver Island, to enjoy the benefits of a healthful environmental experience in an idyllic setting.

The experience begins with an early ride to the ferry terminal where the students board with their packs as foot-passengers. One station wagon comes along as well to provide a backup vehicle and carries the food and shelter materials. When the ferry reaches Otter Bay on Pender Island the students have had a two to three hour cruise and seen two other Gulf Island ports. During the cruise the children tour the bridge and find out how a ferry is controlled.

When the ferry docks the students begin a six kilometer road stroll to reach the homestead. It is usually the first experience many of the students have had with a pack and it is a slow and leisurely stroll through rolling farmland and forest. The students are carrying all of their own personal gear and clothing as well as some cooking equipment. When the students arrive at the site they then have the task of setting up their group shelters in which they will spend the next three nights. While this is taking place several students are preparing the evening meal of a hearty stew. The rest of the afternoon is spent on a walk to a nearby lake and instruction in how to chop wood safely.

After dinner the students gather to sing and hear a story and then they head for their shelters and 'sleep' while the ocean and wind provide a background many are unused to. The five-person shelters are constructed of 6mil clear plastic sheeting (approximately 3x4 m) supported by a ridge-line of nylon parachute cord. The clarity of the night view is also less than soporific but it does aid in the odd bit of supervision necessary and ensures slugabeds are rousted out easily.

The next morning sees dinner preparations in high gear as one half of the group begins to make bread, cinnamon-rolls and pumpkin pies which are baked in the wood-stove oven heated by the freshly split wood of the day before. The afternoon sees a trade-around and more bread and pies are made and baked as well as an evening meal of tortellini a la panna prepared. A wide game in the dusk and some campfire singing and stories finishes the day.

The penultimate day features a more adventurous ascent of the highest point on the island complete with some bushwacking and hill scrambling. The turkey is placed in the oven early in the day and crews are established to maintain temperature and the wood supply. Upon the return the trimmings of the dinner are prepared and cranberry sauce is made. After a short message on the meaning of Thanksgiving in the 1980's the dinner is eaten with gusto. Several of the students eat their first pumpkin pie and a few even tackle the cranberry sauce.

This final evening is finished off with singing and a skit from each shelter group. The students are seen to their shelters to rest for the breaking of camp the next morning.

After rising the next morning, camp is broken and all the students are packed up before anyone eats breakfast. I find that this method of ensuring camp care taking place before food is distributed results in more speed, more cooperation and insurance against missing the ferry due to a faulty time plan.

After a welcome breakfast the students don packs and traipse to the ferry terminal with a definite feeling of 'It should have been longer!' I feel that is the only way to leave a camp.

Brian Herrin, Caulfield School
4685 Keith Road
West Vancouver, B.C.
V7W 2M8

Natural History at Pot Holes

Ellensburg High School
Ellensburg, Washington

"We want students to have fun learning in situations that have made most biology teachers excited about science," said Ellensburg H.S. science teacher Lynn Weissenfels. He, with the help of science teachers Glenn Waltz and Dave Hodgen, has organized and coordinated the annual biology field trip to the Quincy Pot Holes for 16 years, including the most recent last Spring.

"The trip is an attempt to help students develop a greater appreciation for natural history, especially Eastern Washington's," said Weissenfels. "The brief look at plants, animals, and the geology of the area applies to most of this side of the state."

Two days before the date of the trip, Weissenfels takes four instructors (teachers or advanced science students) to the Pot Holes and explains all about its formation, wildlife and vegetation. They are given an outline to learn, and visit 20 sites where students will be able to combine knowledge from the classroom with facts they learn that day to come up with ideas and theories of their own.

The following day, these four instructors return to the Pot Holes with 18 student group leaders and instruct them on how to teach their peers. This domino-like format enables smaller groups (approximately 10 students per group) to be formed on the day of the excursion, thus creating a more intimate and relaxed situation for learning, Weissenfels said. "The group leaders are the key to other students' feelings and the success of the trip. It is a lot of responsibility for them, and most do an outstanding job."

Students investigate soil samples, checking for soil pH, texture, and evidence of clay. They estimate distance using sound waves, yellowing over a gorge into a canyon wall. Plants, such as balsam, bunch grass, hopsage, death camas, and yarrow are identified, observed and their scents noted. Samples of cattail are peeled and eaten. Pollution is noticed and questions are raised as to how long it will take for the area to return to its natural state.

Reasons as to why certain plants grow in some areas (such as moisture and acidity) are explored. Plants are discussed as to their nutritional value; almost every plant has a domestic use—from the burdock whose juice can be used like an antibiotic for burns to the yarrow that when placed on the tongue, numbs it much like an anesthetic.

"The importance of this excursion is to get students out of the classroom to experience firsthand the things they learn in school," said Weissenfels. He often finds that students who have a hard time "book-learning" are excited and interested in the real-life application of science on the trip.

The students board the bus at the end of the day exhausted both physically and mentally. The experience is an enriching one; being witness to many of the things they observe opens their minds and makes science just a bit more interesting.

Megan Dahl
Student
Ellensburg High School

School on the Water

Bowen Island Community School
Bowen Island, British Columbia

A rather unique environmental education opportunity was designed by the Bowen Island Community School primary staff to allow their grades 1, 2 and 3 children the opportunity of looking at transportation from the water side. Bowen Island is a small island located a few kilometers from Horseshoe Bay in West Vancouver and is usually reached by a B.C. car ferry.

The program began when a large charter yacht, a Maple Leaf 67 footer called the Island Roamer, arrived at the Bowen Island wharf and tied up to give the children and their parents a chance to come aboard for an open house in the evening. All the children were present and they were fitted for life jackets and led through safety drills with the parents able to watch and ask questions. The childrens' luggage was placed aboard and after refreshments everyone left to get ready for departure the next day.

A beautiful dawn and sunshine greeted the young sailors as they boarded early in the morning and set sail for Vancouver Harbour. After motoring under the Lions Gate Bridge they tied up to the Rogers' Sugar Refinery wharf and had a tour of their museum. A picnic lunch was enjoyed in their employees park and after a few games to get the kinks out they boarded and sailed to the Port of Vancouver wharf to view a slide show and have a tour of this facility.

Another short sail to the Harbour Police wharf to look at the Fire Boat and then walk into Gastown to have dinner at the Spaghetti Factory completed the evening's activity and after returning to the Island Roamer the boat sailed to Belcarra Park for the night.

The next morning saw them sail to the Vancouver Maritime Museum where they became the first class to visit the facility by boat. There they toured the St. Roch, an R.C.M.P. vessel that first navigated through the North West Passage, and visited the museum facilities as well. A quick sail to Granville Island where the children enjoyed shopping in the market for their lunch makings and a long play in the water park. One of the highlights of this day was a zodiac tour of the Granville Island area to look at architecture along the waterfront and the usage that many people make of this facility. After changing into cleaner and dryer clothing a fine dinner was enjoyed at a local restaurant. Night was spent tied up to the Maritime Museum wharf.

The childrens' last day was spent aboard the Roamer as they motored around Vancouver's University of British Columbia and into the Fraser River proper. There, the children looked at river traffic and transportation as well as the different ways of living and working in this setting. The return trip was begun and lunch was taken ashore from a tie-up to a tug barge. Bowen Island was the final objective and the trip finished with a circumnavigation of the island to allow the children to see their entire island from the sea. The Roamer tied up at about half past three and said goodbye to twenty tired 'sailors' who will never forget their sail into learning.

Sheila Lawson, Principal
Bowen Island Community School
Bowen Island, B.C.

Schoolground Tree Farm

Queets-Clearwater School
Forks, Washington

"Smokey, come and look, this is our biggest tree!" Smokey the Bear was visiting the third and fourth graders at Queets-Clearwater Elementary in the heart of timber country on the Olympic Peninsula. The students were taking Smokey on a field trip through their natural area and nature trail, and were telling him about some of their accomplishments in outdoor education.

The school's program for environmental studies was developed three years ago by teacher Ed Fraust and now features a tree farm, a weather station and the nature trail.

During the first year of the program, volunteer members of the local Lions Club helped to clear a quarter acre of old trees and brush so seedlings could be planted. The Department of Natural Resources donated Douglas fir seedlings and the entire school participated in the planting—from the cook sharing her cold storage area with the young trees to the older students digging the holes for the younger ones to plant and water the seedlings.

In the program's second year, the tree planting expanded to include white pine, spruce and cedar and a nature trail was added by the Department of Natural Resources (DNR). The trail winds through points of interest in the woods and there are plans to identify the various flora and fauna with signs.

The cooperation and volunteered time by people from DNR have made this project successful and culminated in the school winning the long-term Arbor Day Award this spring. Several students traveled with Fraust to Olympia in April to accept the award from Commissioner of Public Lands Brian Boyle and Secretary of State Ralph Munro and to participate in a tree-planting ceremony on the Capitol grounds.

This year students are continuing their environmental work with participation in the President's Environmental Youth Awards program, sponsored by the Environmental Protection Agency.

Clearing would like to continue to recognize outstanding and innovative school environmental education activities or projects such as the ones presented here in future issues. If you currently are involved in a unique program that you would like to share with others, please call or write to Clearing, c/o the Environmental Education Project, P.O. Box 751, Portland, OR 97207 (503) 229-4721 or call the EEAO toll-free hotline within the state of Oregon 1-800-452-8338 and tell us about your project. If you are aware of a project in another school, we would be very happy to hear about them, too.

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BIRDS

Activities for Discovery

These activities were taken from the publication Bird Kit, written by Charlie Hyman, Seth Tibbetts, and Ed Cushman as part of the Naturalist in the Schools Program of the Environmental Education Project back in 1976. Since that time, the Bird Kit sold out all available copies and is currently out of print. In looking around, however, we have not found anything like it for teaching about birds. Hopefully in the next few months the Environmental Education Project will start work on updating and reprinting the Bird Kit, with the hopes of marketing the publication nationally. In the meantime, these activities should get you started on discovering birds with your students this spring.

HOW TO LEAD A SUCCESSFUL BIRD WATCH
OR
(How to succeed in birdwatching without really trying)

Every subject requires its own special teaching techniques, and Birdwatching is no exception. Many a field trip has been lost because the leader was not aware of the special techniques for handling groups in the out-of-doors. Here are some pointers for leading a group of kids on a birdwalk.

1. **Be enthusiastic.** Don't worry if you don't know about the birds.

2. Try to **keep the group as small as possible.** Four to six is an optimum size.

3. **Make sure everyone stays close together.** This prevents rapid movements when a bird is spotted and also helps keep group in touch with the leader.

4. **Move slowly.** This will enable you to see more. How much can you see when you're moving down the freeway at 60 mph? In addition, moving slowly will not scare the birds.

5. **Watch the trees for movement.** Birds usually move around a lot and you can take advantage of this by letting your eyes go out of focus and scanning large areas with one glance. Your peripheral vision will pick out movement in the trees much sooner than if you try to focus on specific branches on the tree.

6. **Use Your Ears.** Birds will often give themselves away by calling or singing. A noisy group will not be able to hear sounds as well as a quiet one. Noise doesn't necessarily scare birds away.

7. **When you spot something, stop.**

8. **Avoid making sudden movements** if the bird is close by. Pointing it out with your arm might just scare it away.

9. A trick for attracting birds which works quite well sometimes: Make a loud "Pshh pshh, pshh" through your teeth. Some birds will come within a few feet if you're absolutely still.

10. **Be discreet;** birds are shy.

11. Vary the speed of your walk. Helps keep students aware.

12. Before you go out bird watching, assign various students in groups to be "experts" in each of the various types of bird groups. For example, one group may be "hawk experts," another may be "duck experts," or "sparrow experts," etc. During the field trip, divide the experts so that each group has an expert on sparrows, one on hawks, etc.

13. Use a checklist or make one as you go along.

14. Encourage students to use the field identification guides if you have them. Discourage being an authority by saying "that's a so and so" and "there's such and such," etc.

15. While watching the birds, try to generate some of the questions about what they're doing, where they're going, etc.

16. Time of day makes a difference in what birds you will see. Early morning is best, before sunset is next best, and the middle of the day is the worst time.

17. Invite a parent or other adult who is interested in birds to come along. Birdwatchers are everywhere. Chances are there is one in your class somewhere.

[illegible]

Nest Building

Description

Students will construct their own nests using natural materials and compare them to real bird nests.

Materials

Birds's nest, sticks, mud, grasses, small natural objects such as rocks, leaves, etc. (See below. If you have not real nests available, students could look for pictures in books. Having a real nest is not essential.)

Procedure

1. Examine bird nest or pictures and discuss reasons for birds building nests (to hatch eggs, and protect the young).

2. Ask students to pretend they are birds building a nest and have them work in small groups or in pairs to try to duplicate the real bird's nest by using the natural materials.

3. After 20-30 minutes, gather in a large group to examine the other nests.

4. Explain that [illegible] that the birds must hide their nests for the safety of their young. (Discuss places where birds build nests (on the ground, high in trees, on cliffs, on overhanging rocks, in barns, etc.).

5. Have each pair or small group of students write their names on a piece of paper and place the paper in the nest. Then have them hide the nest somewhere on the school grounds.

6. The last nest to be found had the best hiding place.

7. Discuss what things people do similar to nesting (build houses, cradles, blankets, tents, mobile homes, campers, tree houses, etc.).

Tips

Be sure that students DO NOT COLLECT ANY NESTS DURING THE SPRING OR SUMMER. This severely disrupts the birds' reproduction processes.

If you know of some neighborhood magpies, dropping feathers from a high place might attract them to use those feathers for their nests. Supposedly, if this is done often enough, the birds will take the feathers from your hand.

Feathers, Feathers, Feathers

Description

In this activity, students collect as many different kinds of feathers as they can on a field trip and bring them back to school where they conduct a series of open ended investigations of feathers.

Materials

One plastic bag per student, or feathers brought from home.

Procedure

1. Pass out the plastic bags at the beginning of a field trip and encourage the students to collect as many different kinds of feathers as they can. Students may tuck bags under their belts.

2. Students collect feathers.

Follow Up

Try some of the following tests:

The Color Test

1. Hold feathers up to a strong light source. Does the color of the feather change? Separate the feathers into two piles: Feathers that changed color and feathers that did not change color. What color feathers changed color? What color feathers did not? Why?

The Shape Test

1. Feathers come in different shapes to do different jobs. Compare a downy feather with a wing feather. How are they alike? How are they different?

2. Have the students separate the feathers into piles of like shapes. Downy feathers together, wing feathers together, tail feathers together. Remember by SHAPE, NOT SIZE.

The Zipper Test

1. Pick up your biggest feather and pull it apart, by separating the little barbs that come out of the central spine. Now run your hand from the base of the feather to the tip and try to zip the feather back into shape.

2. Look at the feather under a hand lens or a microscope and see if you can find the zippers.

The Pen Test

1. Go around with a razor blade and cut the shaft of feather diagonally. What does the shaft look like inside? Try and write your name using the feather as a pen. Look for illustrations or examples of old things written with feather pens.

The Touch Test

1. Pick the softest, fluffiest downy feather you have. These feathers help keep the birds warm and are what sleeping bags are made of.

2. Have a student close his/her eyes and hold out a finger. Lightly brush the feather against their fingertips. Can they feel it? Try brushing their nose. Can they feel that better? Try brushing other parts of the body.

The Art Test

1. Collect sticks and tie a feather onto each stick and use them as paintbrushes.

2. Make a feather wall into your classroom by sticking the feathers students bring into a shape [illegible].

3. Make a mobile out of the feathers.

Bird Concentration

Description

2-4 students play "Concentration" to match beaks and feet of several different birds.

Materials

Six sets of cards showing beak shape and foot design for 8 different birds, tagboard and glue.

Procedure

1. Make one copy of each of the bird pictures, cut them on the dark lines, and paste them onto the tagboard.

2. Place all the cards face down in 4 rows of four.

3. A student turns two cards face up. If they are a match (i.e. beak and feet of the same bird), he/she keeps the cards. If they don't match, the cards are replaced face down in their original positions.

4. The winner is the one with the greatest number of matches.

Variation

1. Find or make pictures of the foods of the various birds, and play the game, matching the bird to its food:

Wilson's Warbler – Small flying insects
Hummingbird – Flower nectar, small insects
Woodpecker – Ants and bark insects
Mallard Duck – Pond animals and plants
Evening Grosbeak – Nuts and seeds
Egret – Fish, frogs
Whimbrel (sandpiper) – Small crabs and mussels
Owl – Mice

Follow Up

Do the "Beaks and Feet for All Occasions" Activity.

Bird Journals

Description

Students will research, organize and illustrate their own notebooks to show how important birds are to us.

Materials

Library, old magazines, field identification guide.

Procedure

1. The journals will need covers, table of contents, dividers.

2. Following is a list of sections to be included:

a. Creative section (story, poem, cartoon, drawings, riddles, folk legends).

b. Superstitions and folklore about birds. Can include sayings (e.g. "birds of a feather flock together") or stories which indicate how people have felt about birds in the past.

c. Bird watcher's diary. Field notes such as date, place, kind of bird, and interesting observations.

d. Newspaper and magazine articles about birds.

e. Bird report on a topic of their choice (e.g. endangered species, current problems, etc.).

3. Students can be graded on neatness and completeness of their journals.

Follow Up

1. Finished journals can be displayed for other classes to see.

2. Invite people from Dept. of Fish and Game, Audubon, or other groups to talk to the class on topics your students studied in their journals.

The Scarecrow

Description

In this activity, students build a model owl in the classroom, place it out in a field near some crows and observe the crows' reactions to the model.

Materials

Papier Mache materials, pictures of owls.

Procedure

1. Have students research what a great horned owl looks like. Sketch out size, weight, height and color on a piece of paper.

2. Build a model of this bird using papier mache.

3. On the field trip have the class keep a sharp lookout for a group of crows. Once spotted, place the model owl in a nearby perch.

4. Sit back in the bushes and observe the crows' reactions to this model.

Follow Up

1. Discuss why the crows responded as they did to the owl.

Weigh A Bone

Description

Students distinguish between bird bones and mammal bones by weighing them and examining their internal construction.

Materials

Bird and mammal bones of approximately the same sizes. Try the following sources for obtaining bones for your class:

Birds: Students can bring chicken and turkey bones from home.

Mammals: Taxidermists, fur breeders, rabbit breeders, soup or steak bones.

Procedure

1. Discuss with students why birds are able to fly and most mammals can not. (Birds have hollow bones.)

2. Hold up two bones of the same size (one bird bone and one mammal bone), without identifying which is the bird bone, ask for a volunteer.

3. Ask the volunteer to hold out his/her hand and with eyes closed, try to guess which of the two bones you will place in his/her hands belong to the bird.

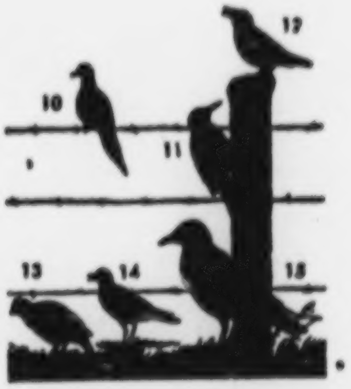
4. Try with several students and get a number of votes as to which is the bird bone.

5. Cut the bones with a coping saw or break them to examine their insides. Not only are bird bones hollow to allow easy flight, but the spaces in the bones are used by the bird's respiratory system for oxygen storage. The air sacs inside a bird's bones help an active bird to stay cool by internal evaporation of water.

Follow Up

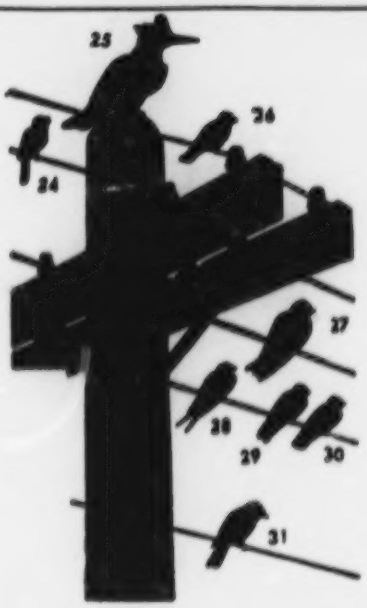
Have students research what part of the bodies the different bones came from.

Make a mobile out of bones using various shapes and sizes.



ROADSIDE SILHOUETTES

1. MOCKINGBIRD
2. CUCKOO
3. CARDINAL
4. BLUE JAY
5. CEDAR WAXWING
6. HORNED LARK
7. UPLAND PLOVER
8. PHOEBE
9. PHEASANT
10. MOURNING DOVE
11. FLICKER
12. MEADOWLARK
13. BOBWHITE
14. KILLDEER
15. CROW
16. GRACKLE
17. STARLING
18. RED-WING
19. COWBIRD
20. HUMMINGBIRD
21. ROBIN
22. KINGBIRD
23. SHRIKE
24. SONG SPARROW
25. KINGFISHER
26. HOUSE SPARROW
27. PURPLE MARTIN
28. BARN SWALLOW
29. TREE SWALLOW
30. CLIFF SWALLOW
31. BLUEBIRD



Adopt A Bird

Description

To actually get out and do something to help local birds, students will build bird houses and keep notes on their inhabitants over a school year.

Materials

Wood, nails, hammer, saw, research materials from school library.

Procedure

1. Birds need your help! Many birds are having to fight for their lives as other birds, mostly house sparrows and starlings, are competing for the holes in trees that they once used.

2. Choose a native species of birds that you would like to see more often and study about them. The following species would be appropriate: woodpeckers, swallows, house wrens, chickadees, wood duck, owls, nuthatches.

3. Use the enclosed chart to find out what size box that the adopted species will use. Build about 10 boxes and put them out in appropriate places around the school neighborhood that you think would attract the birds.

4. Number the boxes and check them 3 times a year (April, June and September), to record what kinds of birds are using them, if any, the number of eggs, young birds. Be sure to keep the boxes cleared of nesting material over the winter.

5. Build the boxes so that one side is hinged and can be easily opened to check on the inside.

6. Map out your route and have the kids make the periodic observations and record the data. Move unsuccessful boxes.

Follow Up

1. Keep the project going year after year, an accurate journal is one of the best tools of an ornithologist.

2. Contact the National Audubon Society for more help.

Feed the Birds

Description

In this activity, students experiment with feeding birds different kinds of food in different ways in order to study bird behavior.

Materials

Popcorn—about ½ grocery bag of popped corn
Stale bread
Grains or chicken feed
Food coloring

Procedure

1. Make your popcorn, stale your bread, buy your chicken feed. Dye ½ of your popcorn red by adding color to the oil when popping.

2. Sit the entire group down on the wall facing the pond.

3. Ask for volunteers to have an adult do each of the following experiments while the students observe. (These should be done very quickly.)

a. Bread Crumbs: Throw out a few handfuls. How do the birds react to the food? To each other? Is there fighting? Is there a leader?

b. Sticks: Throw out a small handful of sticks. Are the birds fooled by them? How do the birds react?

c. Popcorn: Does color make a difference to the birds? Throw out a handful each of white popcorn and colored popcorn at the same time. Do the birds eat one color before another? When all of one color has been eaten, how much of the other color was left?

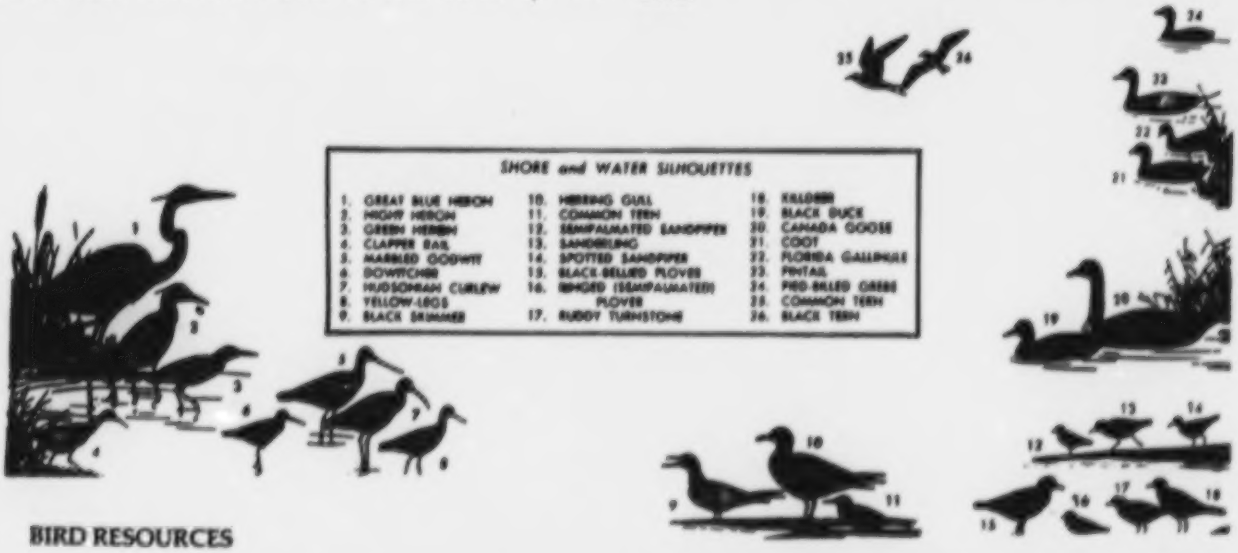
d. Noise: Throw out some bread and when birds are in close, have the whole class yell "BOO" to see if the birds are affected.

e. Movement: Throw out some food and have students wave their arms wildly and SILENTLY. What do the birds do?

4. Distribute the remaining food to the students and encourage them to experiment on their own with feeding the birds.

Tips

Beware of geese; they can bite hard.
Do not overfeed the birds during the experiments.
Go through each of the experiments very quickly.
Students will be very anxious to feed the birds on their own.


SHORE and WATER SILHOUETTES
1. GREAT BLUE HERON
2. NIGHT HERON
3. GREEN HERON
4. CLAPPER RAIL
5. MARBLED GODWIT
6. DOWITCHER
7. HUDSONIAN CURLEW
8. YELLOW-LEGS
9. BLACK SKIMMER
10. HERRING GULL
11. COMMON TERN
12. SEMIPALMATED SANDPIPER
13. SANDERLING
14. SPOTTED SANDPIPER
15. BLACK-BELLIED PLOVER
16. RINGED (SEMIPALMATED) PLOVER
17. RUDDY TURNSTONE
18. KILLDEER
19. BLACK DUCK
20. CANADA GOOSE
21. COOT
22. FLORIDA GALLINULE
23. PINTAIL
24. PIED-BILLED GREBE
25. COMMON TERN
26. BLACK TERN

BIRD RESOURCES

The following books are just a few among the many available for learning about birds. Most of these are for young children, but some can be useful for adults as well. As for field identification guides, there are countless books available. Check your local Audubon Society or bookstore for some that you can use.

Bonforte, Lisa, *Fifty Favorite Birds Coloring Book*, Dover Publishing Inc., New York, 1982.

Bremner, Tony, *How Birds Live*, Usborne Publishing Ltd., London, 1978.

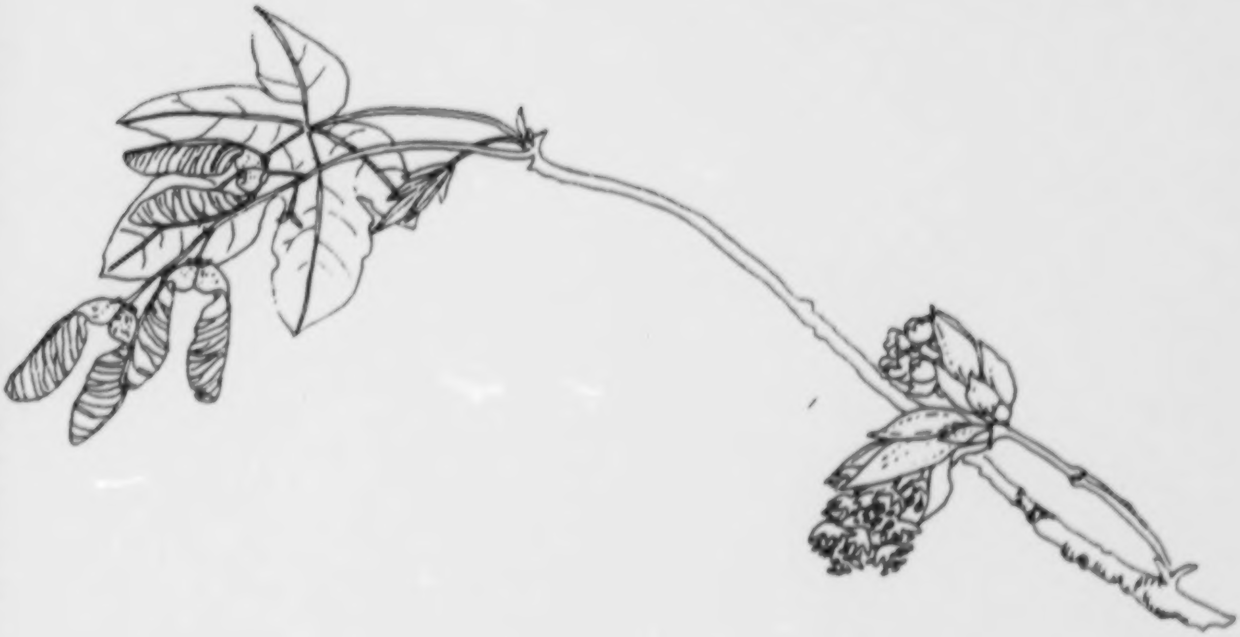
Horsfall, R. Bruce, *Bluebirds Seven*, Audubon Society of Portland, 1978. This book is a collection of watercolors and text by an Audubon Society member in the early part of the century.

Peterson, Roger Tory; Alden, Peter; and Sill, John, *A Field Guide to the Birds Coloring Book*, National Wildlife Federation and the National Audubon Society, Hougton-Mifflin Co., 1982. This coloring book is based on the artwork of Roger Tory Peterson, one of the most reknowned authorities and artists of birds.

Mahnken, Jan, *Feeding the Birds*, A Garden Way Publishing Book, Storey Communications, Pownal, Vermont 05261, 1983.

Kress, Stephen W., *The Audubon Society Guide to Attracting Birds*, Charles Scribner's Sons, New York, 1985.

McNeil, Don, *The Birdshouse Book*, Pacific Search Press, 1979.



Earth Spirit

by Steve Van Matre

This is about giving up old ways of seeing, about loving the earth as a whole, about tapping into the universal flow of life, and about simplifying, yet dreaming. But most of all, it is about our needs as an unusual species of life, needs that must be met if we are to respond to the earth's cries for help.

First, we need a new kind of love to temper our passions. We must give up our childish way so seeing things. Our love has been egocentric, it must become ecocentric. For many of us, our approach to love has been like loving a toe, an earlobe, or an elbow. It's been an unhealthy captivation with the parts rather than the whole. We must learn to love ourselves less and the earth more. This will not be an easy task for we live in the age of nonsense. Bombarded with thousands of messages each day that proclaim how to be loved instead of how to be loving, we have learned to love objects instead of processes.

Second, we need new rituals and parables to remind us of our earthbound roles. A man in India explained to this writer that his mother taught him as a child to pat the earth each morning when he awoke, apologizing for the need of walking upon it. This is the kind of reminder we need today, a way of focusing our attention on what is truly important here. In the Hindu parable of Indra's net, the primeval god Indra casts his net of life into the voids of space. At the junction of each pair of threads in his net of life there is a crystal bead, and each crystal bead is a living thing, shining forth with its own glow, its own radiance into space. And the glow of every crystal bead in the net of life reflects the glow of every other bead.

This is the way life works on earth. Each living thing is a spark of sunlight energy, a crystal bead in the net of life. As humans, like other forms of life, we are only here for a few moments, a mere glistening in time on the film of life covering the planet. When we die, the sunlight energy holding the building materials together flickers out, and those materials that make us up are eventually taken up through the threads of the net by other living things to be used again. Life on the earth represents a continual process of birth and death, decay and rebirth as the building materials are used over and over again by all living things. You see, the earth is not like our mother, it is our first mother. The sky is not like our father, it is our first father. The union of earth and sky beget all living things in this oasis in space.

Third, we need to reach out and embrace life anew. Yes, to hug a tree, to play with the wind, to wear a new costume, to whisper secrets to a flower, to seek beauty in life's becomings. We must not be afraid to act joyously, to display our curiosity, to seek adventure. When asked how he remained so youthful at age 72, Ashley Montague replied, *"The trick is to die young as late as possible."* In this context, we should all strive to die so young.

According to the story of the origins of Zen, the founder of Buddhism had been asked to present a talk on truth to his followers. However, instead of talking, he merely took a flower from a nearby vase and held it up, gazing at it. Everyone in the group was puzzled by this unusual behavior, but suddently one of them smiled knowingly. This disciple became the first teacher of Zen. In a sudden flash he had recognized the point the Buddha was making. Words are just that, words, and nothing more. Reality lies in doing, not thinking.

continued

Earth Spirit

(continued from page 3)

We have become so full of our own importance that we can no longer see much of our roleplaying and posturing and verbalizing for what they are, as Alan Watts suggests, merely the attention-getting antics of a different species. To get out of our own light, our own static a bit, we must take unusual steps, perhaps something as simple as going out at night without a light, or something as complicated as Thoreau's retreat to Walden Pond.

Fourth, we need new watchmen to call our attention to the dangers ahead. On ships at sea men stood watch throughout the night, prepared to alert the passengers to unseen dangers. As we sail the cosmic seas our life vessel may have entered its darkest hours, but the dangers here are all on board. We need a new generation to sound the alarm, a new crew of men and women to help set the course for a safe passage. There is no doubt that turbulent days lie ahead. Will we eventually become a death ship, an eternal reminder in the universe of the dangers inherent in the development of higher forms of life? Or as someone else has expressed it, will our epitaph read: " 'Next time,' God said, 'no brains.' "

Fifth, we need new visions toward which to dedicate our lives. After all, ideas and their symbols change the world. There is an Arabian tale about a prince who inherited a city, only to find his inheritance in chaos. The traders from the caravans had preyed upon the townspeople and, instead of resisting, the townspeople had fallen victim to the evils of corruption and thievery. In an effort to change the situation the prince heeded the urgings of his ministers and proclaimed a new and tougher code of law. However, instead of getting better, things got worse. The disputes, the robberies, the violence increased, and in the end, the caravans began bypassing the impoverished city altogether. At last, in desperation the prince commanded that the best craftsmen of the kingdom should be brought to him. When they had gathered, the prince directed them to build, in great secrecy, a model that he had designed of the most perfect city imaginable. When the artisans had completed their task, the prince had the model installed behind a special screen in the main mosque. Next, he ordered that all newcomers arriving at the city gates should be taken to see the model city, but instructed to tell no one of what they had seen, and no one else was to be allowed behind the screen.

The newcomers, overwhelmed by their vision of an incredibly beautiful city, left the mosque radiant from the experience. The townspeople asked the newcomers over and over what they had seen, but to no avail. Day after day the appearance of the newcomers continued to arouse the townspeople's curiosity, until at last, they went to the palace and demanded to see what was hidden behind the screen in the mosque. The prince agreed; the people were also transformed by the experience, and the prince's dream of a model city became a reality.

Paraphrasing George Bernard Shaw, Robert Kennedy said, "*Some men see things as they are and say why. I dream things that never were and say why not.*" Let's dream new dreams together. Why not a world of millions instead of billions of human passengers? Why not a world where the threat of nuclear annihilation is only a vague, unpleasant memory? Why not a world of small towns spaced miles apart? Why not a world where all of us, not just some of us, pursue more physical, labor-intensive lifestyles closer to the land? Why not a world where there are more tigers in the wild than in zoos?

Let's cage ourselves and let the animals run free.

Let's tear down our egocentric structures and systems and build anew.

Let's find new starts and new songs to follow.

And finally, as Thoreau suggests, let's build some foundations under our dreams.

For if we have the prowess to destroy the earth, then we can surely save it.

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Tropical Rain Forests:

A Worldwide Conservation Challenge

Every autumn, as leaves fall from the trees in a blaze of color, one of nature's most remarkable migrations occurs. Robins turn their backs on juicy earthworms in suburban backyards and head south for the warmth of Mexico and Guatemala. Peregrine falcons exchange their northern breeding grounds for the marshes and forests of Central and South America. The beautiful song of the wood thrush fades to a memory as its singer departs for Costa Rica and Panama. Even the monarch butterfly leaves behind the meadows of North America to flutter more than a thousand miles to a remote mountainside in Mexico. All told, over half of the 650 species of birds that breed in the United States—and countless insects—travel south to winter in Latin America. And every year, their winter home shrinks as logging, ranching, urban development and other forms of deforestation and habitat destruction take their toll.

For more than a decade, migratory bird counts in the United States have been dwindling; experts blame the decline on the loss of the birds' winter habitat. Particularly affected are such birds as the hooded warbler, American redstart and Acadian flycatcher that require mature tropical forests. The potential loss of these creatures due to tropical deforestation is difficult to quantify: Who can estimate the worth of the wood peewee's plaintive call, for example, or the soaring granduer of a peregrine falcon? Yet a number of species do have practical value as well. Each spring, they arrive just in time to control the annual population explosion of insects. If their numbers dwindle because of the loss of both coastal and deep forest habitat in South and Central America, what might happen to American agriculture?

Twenty years ago, a diagnosis of childhood leukemia was tantamount to a death sentence. Less than one in five of those afflicted survived. But that was before scientists began to heed the word of tribal healers in Madagascar. Following clues of native medicine men, the researchers searched out the rosy periwinkle (*Vinca rosea*), a dainty flower found in drier tropical forests and a veritable miniature pharmaceutical factory. From its leaves, chemists derived two alkaloidal drugs, vincristine and vinblastine, that increased the survival rate of children with leukemia to four out of five. But tropical forests are currently being destroyed at an alarming rate. What would have happened if the rosy periwinkle had gone extinct because of forest destruction? And how many of the countless plants are being lost before they are even discovered might harbour similar medicinal wonders?

In 1970, a coffee planation owner in southern Brazil noticed that his plants were beginning to wither and die. He called in experts, who made a sobering diagnosis. The coffee crop, they discovered, was stricken with a particularly virulent form of rust disease. Attempts to contain the outbreak failed and fungal spores carried the blight through Brazil, Colombia, and Venezuela into the plantations of Central America. Farmers spent thousands of dollars spraying fungicide on their valuable crops, but the rust proved impossible to stop with chemical agents. Soon, the multi-million dollar Latin American coffee industry was threatened with catastrophe—and Americans were faced with the prospect of coffee costing over a dollar a cup. The disaster was only averted because of the great diversity of life in the tropical forest. Geneticists discovered a wild strain of coffee from the forests of Ethiopia that resisted the fungus and they used it to transfer resistance to the Latin American crop. But what would have happened if the Ethiopian forests—and their rich genetic resources—had been lost *before* the crucial coffee strain had been collected?

A few years ago, a Mexican biologists discovered an unusual plant in a remote mountain forest in western Mexico. It looked weedy, but it was actually a primitive relative of modern corn. More importantly, *Zea diploperennis*, as it was named, proved to be the only perennial member of its family with the same chromosome makeup as cultivated corn, raising the possibility of eliminating the enormous annual costs of ploughing and sowing in the Corn Belt. In addition, the wild corn is resistant to many of the worst corn diseases and grows in wet soil. If geneticists succeed in transferring these traits to cultivated corn, the payoff for American agriculture would be measured in the hundreds of millions of dollars. Yet the plant almost went extinct before it was found; scientists made the discovery on a hillside that was in the process of being plowed up.

How Great a Loss?

For most Americans, the tropical forests of the world are remote curiosities, as far removed from day to day concerns as the depths of the ocean. We tend to notice them as exotic backdrops for adventure films, perhaps, or as unusual vacation spots, or as a metaphor for darkness within us. Yet the forests touch our lives in countless unrealized ways. Without the myriad habitats, for example, there would be few monarch butterflies and birds in our summer woodlands. Without the plants and animals of the tropical forest, roughly one of every four drugs, including curare, quinine, and scopolamine, might be absent from a typical pharmacy in the United States. Many of our foods—from rice to corn and peanuts—originated with wild plants of the tropical forest and crop geneticists are continually returning to the source to find new and stronger strains. Put simply, tropical forests not only provide a living for billions of creatures, they also supply most of the world's raw materials for agriculture and medicine. Although the forests cover less than 7 percent of the earth's land surface, they contain roughly half its species, in habitats ranging from the cathedral-like mature Amazonian forest to the coastal mangroves of Panama.

But this tremendous resource is now at risk. Tropical rainforests once covered 6 million square miles; now the figure is 3.5 million square miles (about the size of the continental United States) and dropping fast. In Brazil, which has by far the most tropical forest of any country (30.7 percent of the world's total), 30,000 square miles have been lost to cattle ranching alone in the last two decades. Until recently, the destruction of rainforest has been difficult to measure; now, however, scientists are able to chart the loss using satellite photographs. According the the United Nations' Food and Agriculture Organization, world-wide tropical deforestation is occurring at a rate of over 40,000 square miles (an area larger than Kentucky) per year. That works out to 119.5 square miles per day or 53 acres per minute. The rate varies widely from place to place. But to put the destruction in perspective, in the hypothetical event that the current pace is maintained, this vast, irreplaceable sector of our planet would completely disappear within seventy-five years.

As deforestation continues, much more is disappearing than a simple list of species and resources. There is the irreplaceable loss of indigenous peoples and their tribal lore—an important part of our cultural heritage. From the outwardly fierce Yanomamo Indians of Amazonina, for example, anthropologists are learning about the roots of aggression and the importance of kinship in *Homo sapiens*. Meanwhile other scientists translate the poison blow-darts of various South American tribes into lifesaving drugs like curare. From the Lacandon Maya of the Chiapas jungle of Mexico or the Kunas of Panama, we can learn how to thrive in the tropical forest without doing it harm. Yet these native cultures are fast being driven out by logging, ranching and farming—and their knowledge is being lost.

For unsentimental pragmatists, an even more important result of tropical deforestation than the loss of indigenous tribes are effects outside the forest. Whenever a few thousand acres are cleared, a chain of events is set in motion that have regional and even global consequences. The bare ground which replaces dense forest cannot absorb the tropic's torrential rains causing severe erosion and flooding of rich farmland far downstream as well as severe droughts during dry seasons. Silt carried by the uncontrolled run-off fills up dam reservoirs and such important waterways as the Panama Canal. Deforestation brings a sudden end to the constant supply of nuts and seeds falling from the trees into streams and rivers, spelling doom for fish that depend on them for food. Of the 200 Amazonian fish species that primarily eat nuts, at least 50, representing a potential sustainable catch of 190,000 tons each year, are commercially important. The loss of coastal mangrove forests, scientists have also learned, destroys the watery habitat for the juvenile stages of pink shrimp, oysters and dozens of commercially important fish, thus reducing the harvests of coastal and even ocean fishermen.

A Giant Weather Engine

The vast rainforest of Amazonia—and to a lesser extent, smaller forests worldwide—also act as giant weather engines. Amazonia contains two-thirds of all the available fresh water on Earth and discharges one-fifth of all river water that flows into the planet's oceans. Yet more than half of the region's moisture stays within the Amazonia ecosystem, caught in an endless cycle of evapotranspiration and precipitation. Climatologists don't know what will happen if deforestation becomes severe enough to break this cycle, but it is safe to assume that the weather of Latin America—and perhaps even that of the United States—would be profoundly altered.

In addition, scientists worry that the vast amount of carbon being released as millions of trees are cut and burned will have global consequences. Deforestation, they calculate, contributes as much or more to the current build-up of carbon dioxide (CO2) in the atmosphere than the much publicized burning of coal, oil and other fossil fuels. No one knows yet if the rising levels of CO2 will cause temperatures to rise worldwide because of the "greenhouse effect" or fall because of increased cloud cover, but it is likely that something will happen. In effect, we are in the midst of an inadvertent global experiment in which deforestation is playing a major role.

All of these effects and risks might be tolerated, even deemed acceptable, if the benefits of deforestation outweighed the losses. After all, Americans are in no position to tell other countries how to handle their native peoples or conserve theirvirgin forests. Why shouldn't Latin American countries and the Third World nations of Africa and Asia, many of which are both deeply in debt and saddled with rapidly growing populations, make use of their natural resources by logging and converting forest to farm and ranch land? And if a few thousand species go extinct in the process, are not their loss less important than the survival of millions of people in need of land to grown food and wood to cook it?

If there were indeed benefits to be derived from tropical deforestation, Americans could hardly protest the worldwide destruction of rainforest. But the supreme irony—and great tragedy—is that no one is winning. Landless peasants turned jungle homesteaders who eliminate forest habitat discover their new land fails to support a crop a few years after it is cleared. In addition, many of the pesticides that they turn to in desperation build up in the food chain, causing serious health hazards. Cattle ranchers find that a forest teeming with life gives way to pasture that requires up to seventeen acres to support a single steer. Loggers are able to sell only a few species of trees on the world timber market and they destroy as many as ten trees for each one they fell. At best, the exploitation of tropical forests puts short-term gains in the pockets of a very few companies and high-placed individuals—and causes incalculable losses.

A Fragile Web of Life

Most deforestation schemes fail because of the unusual ecology of the tropical forests. We Americans were lucky. When our ancestors cut New England's virgin white pines, new trees sprang up to take their places; when they cleared the forests of the Midwest, the land grew crop after bountiful crop of corn and wheat. But the tropical rainforests are entirely different. In contrast to the woodlands of North America, which develop a deep, fertile humus, tropical forests grow on barren soil because virtually all nutrients reside in living or rotting material. Leaves, branches, fruit and other organic material become the target for termites, fungi, bacteria and other decomposers as soon as they fall from the forest canopy—and sometimes even before. And in the warm, humid tropical environment, decomposition is rapid; litter is broken down and its nutrients are returned to trees and shrubs within six weeks. In North American boreal forests, the process takes over 60 times longer.

Tropical trees have evolved a number of strategies to survive in this environment. Their roots are shallow but extremely dense in order to catch all of the water and nutrients that land on the forest floor. In addition, most trees have developed symbiotic associations with soil fungi known as mycorrhizae to help them capture nutrients. Some even put out roots high in the canopy to suck vital elements from small piles of decomposing litter in branch forks and other crevices. Because the shallow roots provide little structural support, many species of forest giant add huge woody buttresses to keep them standing upright.

The elaborate root systems are vitally important. Most soils in the tropical forest are ancient, the product of eons of weathering. As a result, they are deep, up to 60 feet in some areas, but are unable to hold nutrients. Dig into the ground in the Amazon, for example, and you will find soil that is almost white from its high content of barren silica. Any nutrients that escape the network of roots near the surface quickly leach out of the soil. And if the protective vegetation is removed, the soil can quickly erode, forming gullyed badlands.

When the forest is cut and burned, the nutrients locked up in vegetation are turned to ash and released into the soil. For a year or two, the soil is fertile, growing such crops as soybeans or grass for cattle with reasonable yields. But as rains wash out nutrients, fertility drops precipitously. In Zaire, for example, the amount of rice grown on a forest plot in the second year of cultivation is less than one-quarter of what it was during the first year. In much of Central America, the stocking rate of cattle, which is a mere one head per hectare (2.47 acres) during the first year after forest clearing, drops to 5-7 hectares per head within 5 years.

The productivity lost when tropical forest becomes farm or ranch is even more staggering. Typical beef yields on ranches in the rainforest of Chiapas, Mexico, where soils are better than average, are 22 pounds of meat per hectare each year. Yet the indigenous Lacandon Maya are able to produce up to 13,000 pounds of corn and 10,000 pounds of root vegetable crops each year on the same amount of land in the same rainforest without the use of harmful pesticides. Small wonder then that Amazonian caboclos (people of mixed blood that live in the rainforest) have a saying that goes: "Where cattle move in, we move out, because cattle mean hunger."

Poverty and Exploitation

But it is a mistake to blame population explosions and land-hungering peasants for the destruction of tropical forest. The real causes lie deeper, reaching back layer after layer to social mores, class conflicts, political expediency—and even to the way America supports development in the Third World. On the one hand, the conclusion that deforestation is not an inevitable consequence of rising populations makes the loss doubly tragic for being so unnecessary; on the other, it raises the encouraging possibility that the vicious cycle can be halted.

The complexity of causes can be seen at work in Brazil, home of almost one-third of the world's rainforests. With vast areas of undeveloped "campo" (rich prairie) available, there never has been a real land shortage in Brazil; in fact, enough good, permanently cultivable land exists outside of Amazonia to give each Brazilian 3.3 acres. Unfortunately, virtually all of that land is already owned, mostly by a few large landowners. One percent of the farmers hold almost half of the country's farmland, and many of the largest holdings are underused or even unused. In addition, government policies and economics that favor large landowners have forced thousands of small owners to sell out. The result has been the creation of a land-hungry underclass—with all the potential for seething social discontent.

What better way to deal with the problem than to send the landless poor into the tropical rainforest? After all, tropical jungle typically is an embarrassment to governments of developing countries because of the backwardness it represents to the nation's leaders. And so Brazil opened Amazonia to colonization in the 1960s, promoting the "New Frontier" in a blaze of nationalism. Highway construction, funded largely by multilateral development banks and foreign aid agencies, started in 1968 and wave after wave of settlers followed, drawn by the lure of free land. By 1975, 44,000 square miles of forest had been cleared. But the grandiose scheme became a disaster. Because only 2 percent of Amazonia's soils are permanently cultivable, the settlers' crops failed and their land was abandoned or absorbed by huge unproductive cattle ranches. "In retrospect," writes tropical forest expert Nicholas Guppy, "the colonization scheme looks almost like a costly and destructive Machiavellian plot to procure cheap labor for ranches."

The same script is being played over and over in Latin America and around the world. Loggers or colonization projects first open up the rainforest by building roads. The roads then fill up with peasants in search of land, driven by population growth, hunger, poverty and a social system that allows 7 percent of landowners to control 93 percent of the arable land in Latin America. The peasants clear the forest, but soon their crops fail and they move deeper into the forest to repeat the cycle.

Loose Purse Strings

In the last decade, the problem has been exacerbated by the loose purse strings of the Western world. In 1976, outstanding loans to all of the world's developing countries totaled $75 billion. Now, Brazil alone owes more than $90 billion. Lent with inadequate safeguards or controls, the money has strengthened governments and made possible such grandiose schemes as dams, highways and forest colonization. At the same time, skyrocketing interest payments on their debt are forcing nations to shift their economic emphasis from self-sufficiency to cash-producing exports. More than half of Central America's lowland rainforest, for example, has been replaced by marginal pastureland that is producing beef for fast-food hamburgers and TV dinners in America. Yet invariably, the revenue gained from beef and other cash crops for export fails to meet either expectations or need. Governments then begin to cash in their capital resources—forests and minerals. As environmental destruction mounts, wealth is increasingly transferred from poor to rich.

Not surprisingly, ironies abound in this world of misplaced priorities. The rubber trees being felled and burned in Brazil could have met the country's demand for rubber many times over. Yet the South American nation currently imports two-thirds of its rubber. Rondonia, in the far west of Brazilian Amazonia, imports virtually all its fuel—bottled gas for cooking and Mid-Eastern oil for power stations—while its forests go up in smoke. Much of the natural produce of the rainforest, such as Brazil nuts, are actually worth more in the export trade than the "cash crops" which are replacing the forest. And the pesticides required to grow the cash crops are not only harming wintering birds, they are beginning to cost more than the crops are worth because of increasing insect resistance to the chemicals.

Towards a Solution

Not everyone in the Third World is unaware of the causes of deforestation. In country after country, small but influential groups dedicated to the preservation of natural resources are forming. At least 5,000 of these groups have been organized throughout the world and they are beginning to have an impact. In Ecuador, for example, a conservation organization named *Fundacion Natura* has begun changing public attitudes towards tropical forests with television advertisements and educational programs—and may have even prevented the government from sending another wave of "settlers" into the rainforests. In Honduras, dozens of communities, with help from CARE, are planting trees to stabilize hillsides and reduce erosion. The National Wildlife Federation, anxious to reduce the losses of precious biological resources and to protect the winter habitats of the birds that Americans treasure, has begun an International Program to help groups like *Fundacion Natura* and to spur more reforestation projects. In addition, the Federation's program is designed to offer solutions to the problem of deforestation to international development agencies whose actions can either help or harm forest resources in the Third World.

These efforts are beginning to have a modest impact. Under the prodding of conservation groups, the U.S. Agency for International Development has raised the priority of environmental and natural resources in its foreign aid program. The agency is now devoting millions of dollars to environmental impact studies of its projects, training programs for Third World resource management professionals, environmental education efforts and tropical forest research. The agency is also a leading voice among international aid organizations in promoting solutions to the interconnecting problems of environment and development.

Once the causes of deforestation are understood, solutions are hardly mysterious. The highest priority of the United States and other Western countries should be convincing Third World governments of the folly of "taming" their tropical forest "frontiers"—and halting the destruction before more species and resources are lost. Stop giving huge loans for highways through the forest and gigantic dams that flood hundreds of square miles of irreplaceable resources; start giving the tropical countries financial incentives to save the remaining sections of rainforest.

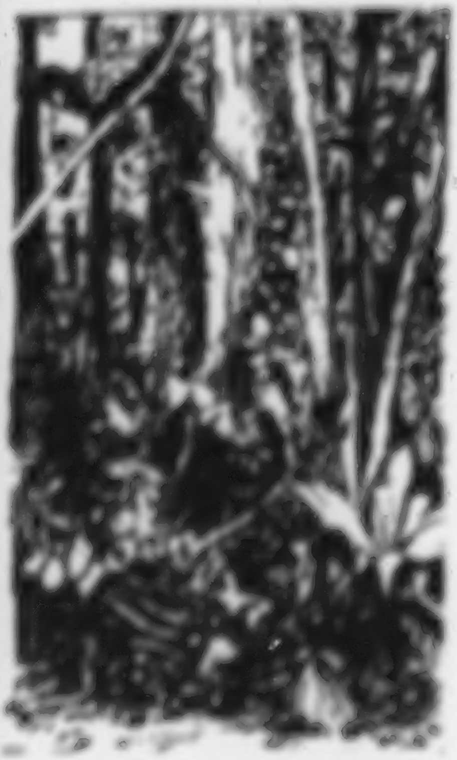
It is not something that can be done piecemeal, because the forest ecosystem is so complex and interdependent that it will not survive intact even in moderately sized chunks. If one species of wasp is missing because an island of forest is too small or too isolated, for example, all of the fig trees that depend on the insect for fertilization may eventually die. With the fig trees gone, monkeys that eat them and help disperse and germinate seeds of many types of trees may disappear, setting off an endless chain of further extinctions. The forest is, in effect, an intricate and fragile tapestry; pull out one thread and the whole pattern may unravel.

The second step towards a permanent solution is learning the secrets of the rainforest. Virtually any casual traveller in Amazonia or other tropical forest will find plants and animals rarely seen by modern man; which ones have chemical defenses or complex biochemistry that might lead to new, biodegradable pesticides or more effective drugs? Where are the rare areas with soil fertile enough to support plantations of trees or corn? What are the ecological connections among the millions of species in the rainforest? How have native tribes exploited those connections?

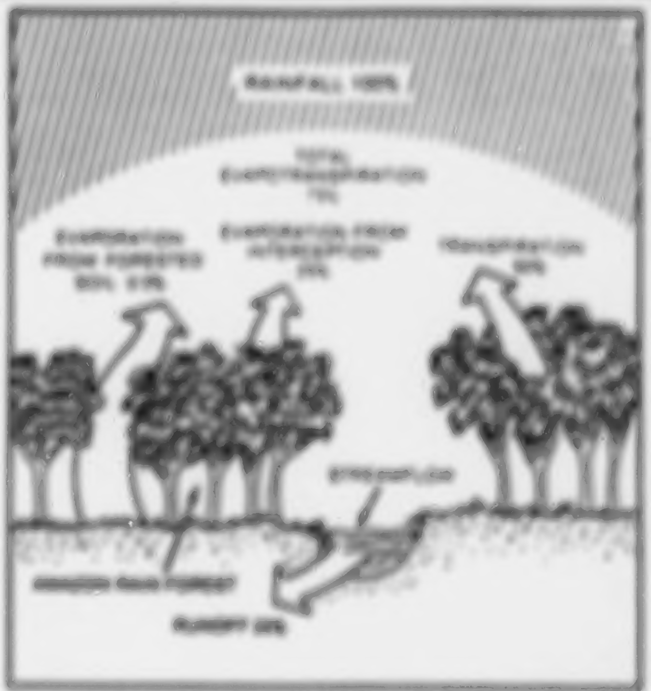
With better knowledge we can devise methods to utilize the forest resource more responsibly. Current logging practices in many countries, for instance, are almost criminally wasteful. Because only a handful of species are commercially valuable, loggers cut only a few trees out of thousands. By damaging up to a dozen trees for each one they fell and scarring the soil with skid trails, however, they may severely degrade the entire forest. If the forest is to be harvested, responsible uses for currently neglected species should be found. An enterprising Kenyan sawmiller, for example, recently created a desirable furniture wood simply by promoting a little-known tree as "Mount Elgon Rosewood." In addition, the tropical forest ecosystem is full of potentially valuable products other than wood, including fish, animals, nuts and fruits. And, as the Lacandon Maya demonstrate, it can support a bountiful agricultural harvest.

The final, and perhaps most difficult, course of action is changing the economic and social conditions that lead developing countries to squander their rainforests. The remedies must include land reform, intensive and ecologically sound agriculture on fertile bottomlands and prairies (without the use of such persistent pesticides as DDT), replacement of mammoth development projects that plunge countries into debt with small scale enterprises that actually work, and the realization that tropical rainforests are national treasures instead of symbols of backwardness. It is a daunting task and Americans, as the major financial supporters of economic development projects in the Third World, must bear our share of the blame for past mistakes. Now, it is our duty to both correct our own policies and support new efforts to halt deforestation. For with every acre of tropical forest that disappears, we lose a bit more of our priceless biological heritage.

Information for this article was taken from "Our Threatened Heritage: A Worldwide Conservation Challenge," a booklet produced by the National Wildlife Federation, 1412 16th St., N.W., Washington, D.C. 20036.



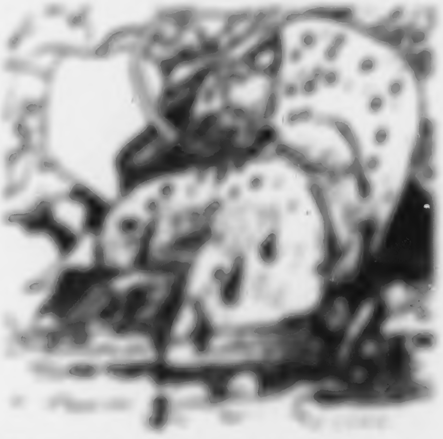
Every nook, cranny, and niche is occupied with something that grows.


RAINFALL 100%
TOTAL EVAPOTRANSPIRATION
EVAPORATION FROM FORESTED SOIL
EVAPORATION FROM INTERCEPTION
TRANSPIRATION
STREAMFLOW
AMAZON RAIN FOREST
RUNOFF

The cycle of evapo-transpiration and precipitation in the tropical rain forest

Deforestation contributes as much or more to the current build-up of carbon dioxide (CO2) in the atmosphere than the much publicized burning of coal, oil and other fossil fuels.

Amazonia contains two-thirds of all the available fresh water on Earth and discharges one-fifth of all river water that flows into the planet's oceans.



Most rainwater finally reaches the forest floor as a mild drip and trickle.

Decomposers are vital links in the eternal cycle of death and rebirth.

The Rain Forest

A global heritage

For more than a decade, migratory bird counts in the United States have been dwindling; experts blame the decline on the loss of the birds' winter habitat.

An unbroken layer of tree tops spreads as far as the eye can see.

[illegible]

Developing a School District Environmental Education Program

A continuous program of educational experiences is needed for the development of attitudes, values, and, eventually, a global environmental ethic which can serve as the basis for positive action for environmental quality. Thus, it follows that a districtwide environmental education program be planned and implemented.

District Environmental Education Program Committee

The first step to be taken in developing a program is to form a districtwide environmental education program committee. The membership of this committee should be chosen to insure that all groups affected by the developing program will be involved in decision making. Ideally, committee membership should include: administrators, teachers representing grades K-3, 4-6, 7-9, and 10-12, teachers representing [illegible] subject areas [illegible] science, social studies, health, art, and the language arts, and, if possible, school board members, students, and citizens representing environmental protection agencies, organizations, businesses and industries.

Philosophy, Goals and Objectives Statements

The committee should develop a school district environmental education philosophy statement which reflects the district's overall educational philosophy. The statement of philosophy should be approved by the school board and administration.

The committee might also develop an official school policy statement on environmental education which could be submitted along with the philosophy statement.

Once a statement of philosophy has been developed, a statement of goals and objectives should be developed. The goals statement should relate directly to the newly developed environmental education philosophy.

Two kinds of objectives need to be identified. Program objectives should deal with the major tasks that must be accomplished in order to firmly establish the program. They might deal with the assessment of the current program, development of the scope and sequence, staff preparation, and equipment and material acquisition. Instructional objective categories also need to be developed.

Assessment

In order to know what steps must be taken to develop a program capable of achieving the identified goals and objectives, a determination of what already is taking place should be made. A survey instrument based on the philosophy and goal statements should be developed in order to collect the necessary data. Such a procedure helps to identify existing strengths and weaknesses.

Scope and Sequence

The development of scope and sequence for environmental topics is another responsibility of the district environmental education committee. It is important that this task be completed before the infusion of topics begins and be discussed and shared with the staff to prepare them to carry out the infusion process.

Staff Preparation

The actual infusion of environmental topics into existing curricula should be done by as many of the teaching staff as possible. Those who participate in such an activity will generally be more willing to accept and utilize the parts of the curriculum which they have modified.

At a minimum, staff members who are not members of the environmental education committee should be helped to understand the philosophy statement, the goals and objectives statements, the elements of the scope and sequence with which they will work, and the infusion process.

Most teachers will need additional preparation in environmental education content and methodology.

Infusing Environmental Content

Once the staff has been prepared, the actual task of infusing environmental content can begin in earnest. The district environmental education committee should assist in this activity as needed.

Environmental education should permeate the entire curriculum, with every subject area at every grade level dealing with the environment in some way. Some subject areas, by their very nature, present greater opportunities for the infusion of environmental education, but all have a role to play.

Suggestions regarding potential subject area roles follow.

[illegible]

[illegible]

[illegible]

Materials and Equipment

[illegible]

Facilities and Community Resources

[illegible]

[illegible]

Evaluation

[illegible]

[illegible]

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This article, and the quotes and Native American graphics throughout this issue, were taken from Star Stories, a publication of the Native American Science Education Association, 1228 M Street, NW, Washington, D.C. 20005. Copies of the publication are available for $2.00.

"The Great Mystery"

> *The most beautiful and deepest experience a man can have is the sense of the mysterious. It is the underlying principle of religion as well as of all serious endeavor in art and in science... To me, it suffices to wonder at these secrets and to attempt humbly to grasp with my mind a mere image of the lofty structure of all that there is.*
>
> *Albert Einstein*

Wakan Tanka is the Lakota term for the Great Spirit, Great Mystery, Sacred and Mysterious Wonder, Creator of all things. The universe is a reflection of this great power. Since the beginning of time people have observed these mysteries with reverence and awe. In looking at the vast world of the celestial realm, one realizes the greatness of its grand design, and how small we are as individuals. At the same time, it is evident that each of us, as each star in the sky, is a part of the whole, a piece of the Great Pattern.

Native American values reflect ancient wisdom gained from centuries of observations of the universe in motion:

- Life is always changing, yet there is a pattern to the changes. We learn to value essence rather than form.

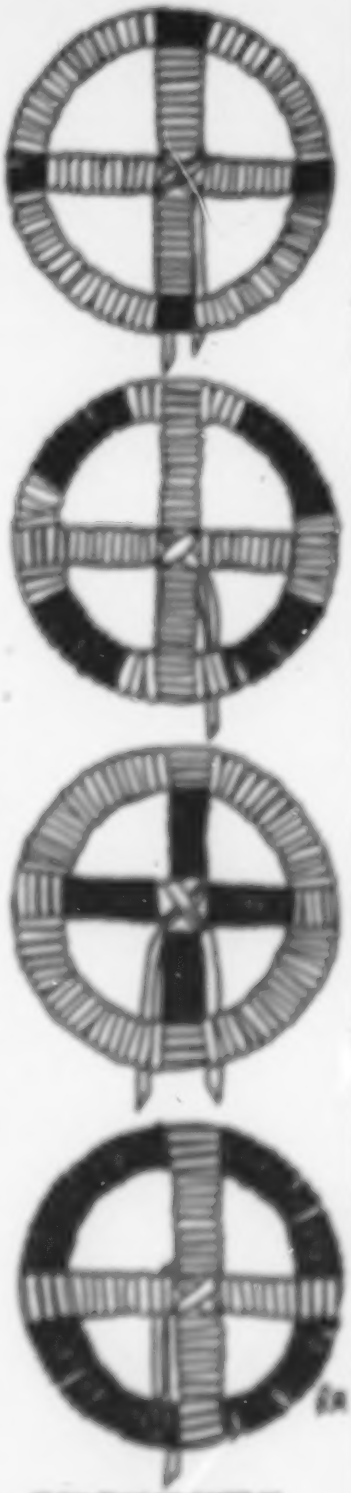
-Life moves in a circular flow. The end of one cycle is actually the beginning of the next. A circular element is always apparent in the changing of the seasons, the pattern of the moon's phases, the points of the rising and setting of the sun. We are all a part of the Great Circle of Life.

-Life has vivid contrasts as day and night, male and female, sky and earth, body and mind. There is a balance and strength in this duality, evidence of the harmony and symmetry that exists within Creation.

-Life is interrelated. By realizing we are all a part of the whole and interdependent upon others, thoughtfulness and respect precede our actions.

The Native American concept of the cosmos personifies the Sun and the Moon, the Sky and the Earth. This deep personal relationship enhances our respect of all life. The Great Mystery connects the motions of the universe to each of us.

Whatever our perception of the world, it has arisen from the need to organize and derive meaning out of endless observations in our environment. From this process of ordering and orienting our lives arises this collection of oral traditions, the foundations of our physical and spiritual knowledge. When we experience sky and star stories through the eyes of Native Americans, we can catch a glimpse of the significant learning and understanding of the cosmos of a people whose very survival has long depended upon choosing wisely and living harmoniously with the land, all its inhabitants, and the forces of Creation.



"Medicine Wheels" made of rawhide and porcupine quills symbolizing the Great Circle of Life and the sacred number four representing the four directions, four ages of humankind, four elements...

The ancient people studied nature: weather patterns, cycles of plant growth, movements of game and the dynamics of the sun, moon, stars and planets. They developed the ability to predict many of the changes of nature which helped them to organize and understand the world in which they lived. This consciousness of the cycles of life was reflected in ceremony and daily living, and continues to be reflected in contemporary Indian culture.

Life was arranged and defined into phases of time using solar and lunar calendars. Examples of the cylical system of a lunar calendar are evident in many tribes. The "moons" were referred to by names of events that occurred in the natural environment. Because natural phenomena happen at different times from year to year, one rigid calendar could not have been developed.

the wise man
who meditates
on the goodness
of all that exists
in the sky
in the earth
in the lakes
and in
the sea...

-Maya

Close observation of weather, sky, plants and animals could provide much information about what would happen the following season. For instance, some of the Lakota names for the "moons" are Moon of Wild Onions, also called Moon of Sore Eyes; Moon of Cracking Bones for Marrow (food was scarce), also called Moon of New Green Grass; and Moon of Ponies Shedding Hair (see the comparison chart for naming used by other tribes).

The events on the Great Plains are contrasted by the Woodland Iroquois "moons": Maple Sugar Moon, Planting Moon, Wind Moon, and others. Each of these lunar calendars name significant events from very different environments and ways of life. There were often several names for a "moon", reflecting the many occurrences in Nature. The chart shown below lists examples from five tribes.

A lunar month consists of approximately 28 days. There are four major phases, each lasting seven days. The numbers four and seven are considered as sacred by many tribes. Their symbolism is deep and all-encompassing, a recognition of the intrinsic order and power of the Great Mystery.

Today, although the Gregorian calendar, digital clocks, computers and other modern technological devices are in wide use, our lives are still very much linked to ancient wisdom known to us through Native American oral traditions and powerful graphic symbols left by Native American ancestors to remind us of our origin and purpose in life.

Now, as then, we have the expansive sky overhead, willing to release secrets and knowledge to those with patience to observe the periodic rhythms in the passage of time.

The Papago refer to the North Star as "The Star Who Never Walks" because it appears to be stationary, while the others travel in a circle around it. This star has been a fixed point of reference for navigation and orientation in this ever-changing existence of our world.

Studying astronomy concepts through American Indian oral traditions can serve as a "North Star," leading the student and teacher to combined knowledge and feeling for the interrelated, inseparable relationship of all people to the physical and spiritual forces that guide us and govern the laws of this Great Mystery.

LUNAR MOONS COMPARISON CHART

Examples of Lunar Moons named for Events in Different Tribal Environments*

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
APRIL *	[illegible]	[illegible]	Maple Sugar ☽	[illegible]	[illegible]
MAY	[illegible]	[illegible]	Planting ☽	[illegible]	[illegible]
JUNE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
JULY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AUGUST	[illegible]	[illegible]	Green Corn ☽	[illegible]	[illegible]
SEPTEMBER	[illegible]	[illegible]	Harvest ☽	[illegible]	[illegible]
OCTOBER	☽ of Falling Leaves	[illegible]	☽ of Falling Leaves	[illegible]	[illegible]
NOVEMBER	[illegible]	[illegible]	Hunting ☽	[illegible]	[illegible]
DECEMBER	[illegible]	[illegible]	☽ of Long Nights	[illegible]	[illegible]
JANUARY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FEBRUARY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MARCH	[illegible]	[illegible]	Wind ☽	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

Old Growth Forests

The Ecology of Old Growth Forests

In the past, the great trees of the Pacific Northwest grew undisturbed for hundreds of years, unthreatened but by fire, wind, or disease. Towering hundreds of feet above the forest floor they would eventually become a part of the Old Growth, sheltering the area below and creating a protected microclimate.

As a mature stand ages, the single layer canopy becomes broken as trees die and fall to the ground. Seedlings growing in the available space and sunlight create a multilayer canopy, and the fallen trees provide groundlayer habitat. Old Growth forests provide abundant living, travel, and forage space for 163 species of animals, 65 of which are mammals. The Old Growth Douglas fir forests of the western Cascades may well support the densest breeding bird population of any forest system in the world.

Conservationists have long argued that the remaining 10% of original Old Growth represents an ecosystem that is unique to the Northwest, and that as much acreage as possible should be preserved. Recent research is indicating that Old Growth ecosystems are valuable not only in themselves; they may well be important components in assuring productivity in surrounding second growth stands.

The work of forest ecologists such as the Bureau of Land Management's Chris Maser suggests that interactions within the Old Growth system are significant in assuring adequate nitrogen and nutrients for developing forest systems. Maser's work has focused on the symbiotic relationships between Old Growth Douglas fir and the populations of lichen and fungi it hosts. The length of time the Old Growth stand flourished uninfluenced by human activity enabled unique relationships to develop between the trees and the relatively tiny growths they support. An interdependent, symbiotic exchange has enabled the participants to thrive over centuries of time. The lichens, notably *Lobaria oregana*, are nitrogen-fixers. They enhance the supply of this nutrient, vital to the health and growth of not only the tree but of other forest plants as well.

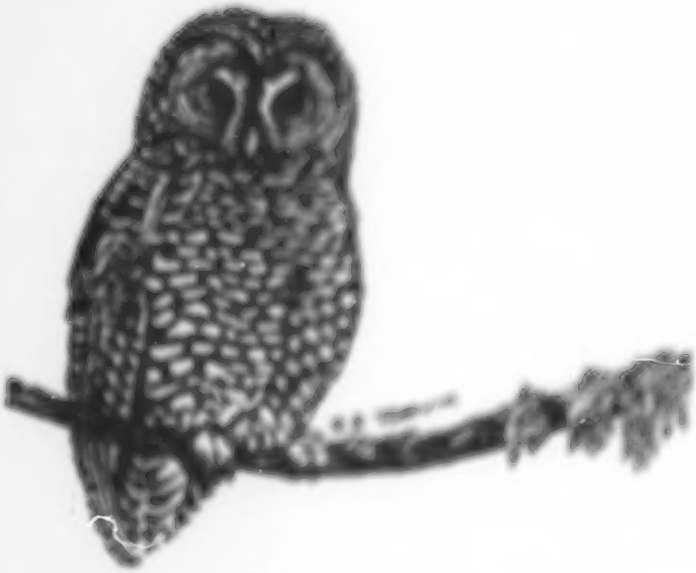
Another symbiotic relationship, perhaps much more vital to the survival of the tree, is that which has developed between Douglas fir and mycorrhizal fungus which develops on the root tips of the tree. The fungus enables the tree to pull in greater amounts of nutrients and thus grow to its amazing size. Considering the fierce competition for space and sunlight in the Old Growth forest, the seedling Douglas fir that is not inoculated has far less chance of survival.

The fungus, which necessarily exists below the ground, sends up fruiting bodies (mushrooms). The underside of the mushroom is packed with spores, the fungi's reproductive agent. Although wind or water movement moves the spores quite easily, the primary agent of transport is a small forest-dwelling rodent, the Northern Flying Squirrel. The mushrooms are the staple food source for the small inhabitant of Old Growth. Its dependence on the mushrooms as food and its importance as the transport agent of the spores through fecal deposition make the Northern Flying Squirrel the third agent in the symbiotic interrelationship that has developed in Old Growth forests. In addition, large animals such as bear, deer, and elk all inoculate the forests in the same way as the smaller creatures. Browsing through Old Growth and clearing alike, they consume the spore-bearing mushrooms at one point and deposit it in droppings at another.

When Old Growth is harvested, the nitrogen-fixing lichen and nutrient-enhancing fungi die with the tree. The habitat of the spore-transferring animals is lost. Chris Maser has stated in his work that without mycorrhizal fungi we cannot grow Douglas fir unless chemical enhancement is used throughout the lifespan of the tree.

Until the symbiotic relationships within the Old Growth ecosystems are better understood, we cannot assess the effects of harvesting Old Growth at the current rate of 2% to 4% a year. It is quite possible that the fungi and lichen are produced primarily in Old Growth and transported to second growth areas. If this is found to be the case, harvesting Old Growth may well lessen the viability of surrounding second growth areas.

Beyond the elegant symbiosis that Maser's work is beginning to reveal, it is increasingly clear that Old Growth provides many ecological benefits that intensively managed forests do not. Mixed-age and multiple species forests create greater diversity and abundance of wildlife habitat. Dead and down wood on the forest floor performs several crucial



functions in the process of forest development. Decaying wood provides moisture. The organic debris that enters waterways creates more diverse habitat by providing shelter and changing waterflow patterns. It also provides a food source to some water dwellers and traps sediments moving in the water. The large organic debris that is carried downstream into estuaries provides the same benefits to inhabitants of the delicate intertidal zone.

Ideally, Old Growth forests should be preserved because they represent a unique and priceless interaction between earth, organism, and animal. Realistically, Old Growth will disappear within decades if current harvesting rates are maintained. Old Growth used to cover 15 million acres in the Pacific Northwest. Only 3 to 5 million acres remain. No more than 1/4 of that is on land protected from timber harvest.

Our forest technology allows us to grow trees, but our knowledge of the forest ecosystem is nowhere near adequate to allow us to recreate Old Growth. As new research such as Maser's is completed, it may become clear that the benefits of maintaining Old Growth forests outweighs the benefits of the profit obtained through their harvest.

Spotted Owl: An Indicator Species for Environmental Quality

Of all the inhabitants of the Old Growth forest, the Northern Spotted Owl has drawn the most attention. These gentle denizens of the deep woods are dependent on Old Growth. They are declining in number as Old Growth systems are logged throughout their territory. Current estimates are that approximately 2,000 Northern Spotted Owls remain in the region from Northern California to Southern British Columbia. Recent studies indicate that the population may be declining at a rate as rapid as eight percent per year.

The Spotted Owl ranges primarily in Old Growth Douglas fir and Hemlock stands below 4,000 feet in elevation. Spotted Owls have been tracked in undisturbed Old Growth east of the Cascades, but most of the remaining population dwells along the west coast.

There is growing concern that the remaining owls may become genetically isolated from each other because of the adult reluctance to cross natural barriers such as the Columbia River or large open spaces such as heavily logged or developed land.

The Spotted Owl prefers undisturbed Old Growth for all aspects of its existence. Areas in which the owls nest, roost, and forage generally exhibit a multilayer canopy. The trees are uneven-aged and the canopy construction consists of an overstory and one or two level secondary growth as well as ground layer vegetation. Snags, fallen trees and diseased trees abound, as well as trees with broken tops. Openings such as clearcuts and topographical barriers such as ridges form range boundaries.

Juvenile owls will cross such barriers to disperse to their own home range. Perhaps the need to disperse drives the juvenile to such behavior; it almost certainly adds to the high juvenile mortality rate.

The Need for Old Growth

Old Growth conifer forest is the overwhelming choice for forage grounds. The only other forest type utilized for forage is mature, multilayer conifer forest. Spotted Owls exhibit no preference for any other forest type, and avoid clearcuts, burned-over areas, and young timber stands.

Cavities in diseased trees are the preferred nesting site, although owls have been observed nesting on platforms formed by a windbroken top and a secondary growth system. The owls favor nesting sites near a permanent water source and require an area boasting a well-developed understory to provide fledgling birds with perches.

The unique structure of Old Growth is the key factor in Spotted Owl preference of it as habitat. The Old Growth creates a microclimate beneath its canopy that keeps the temperatures warmer in winter and cooler in summer, and it provides shelter from inclement weather. The understory and ground layers provide habitat for the owl's prey but the construction is loose enough to afford the owl flight space. Additionally the density of Old Growth protects the owl from predators. The Spotted Owl feeds primarily on small mammals. Staple food in the northern end of the range is the Northern Flying Squirrel, and in the southern part of the Spotted Owl's range the Dusky Woodrat takes precedence as the main food item. Redbacked Voles, Tree Voles, Deermice, shrews and , in summertime, insects, small birds, and juvenile Snowshoe Hares make up their basic diet.

Declining Numbers

Data collected by Gary Miller indicates that Spotted Owl populations are presently on the downswing in Oregon. Not only is juvenile mortality quite high, the Spotted Owls in Oregon have failed to breed in three of the last four years. Recent research by Russell Lande indicates that from a demographic standpoint, almost 60 percent of juvenile owls must survive to reproductive age if the species is to remain stable. Juvenile dispersal is the most critical period in the Spotted Owl's existence. The juvenile birds tend to be less wary than adults, and are often taken by predators such as the Great Horned Owl. As suitable habitat dwindles, the young birds are forced to travel farther in search of a home range. The further the dispersal distance, the less chance of survival the juvenile bird has. Often the juvenile birds will starve to death during the dispersal period.

Increasing Pressure

Population distribution and density are directly related to availability of suitable habitat. Most of the remaining habitat not already designated as Spotted Owl Management Areas (SOMAs) or removed from the timber base on public lands has been harvested or is scheduled for harvest in the near future. Therefore, should the Spotted Owl population begin to recover, there would be no new area for the fledged offspring to inhabit. Additional pressure may be occurring on Spotted Owl populations because of the recent invasion of the more aggressive Barred Owl into the Spotted Owl's remaining habitat.

Forest Management and the Spotted Owl as an Indicator Species

While the owl was never federally listed as threatened or endangered, it was listed as threatened by Oregon and sensitive by Washington. Following passage of the National Forest Management Act (NFMA) in 1976, it became clear that the Spotted Owl met many of the NFMA's criteria for 'management indicator species.'

Status as a management indicator species meant the owl would have to be planned for in every forest plan. It also meant that the owl was rapidly becoming the lightning rod in the debate over the protection of Old Growth forests. An interagency task force of wildlife biologists in Oregon recommended as early as 1973 that 400 pairs of owls, each on 300 acres of undisturbed Old Growth, was necessary to maintain a viable population. By 1981, Washington state was also a participant in the Task Force.

The Task Force revised their acreage estimates upward to 1000 acres a pair. Current research indicates that more than 2000 acres per pair may be needed to maintain the population.

The Future

The U.S. Forest Service and the Bureau of Land Management are currently making plans for future timber harvests of federal lands. The plight of the Spotted Owl is becoming a critical factor in the fight to save Old Growth forests from being cut.

While much has been learned about Spotted Owls in the last 15 years, much critical research remains to be done. What is clear, however, is that the longterm viability of the owl is dependent on large tracts of undisturbed Old Growth. If cutting of Old Growth continues at current rates, no amount of research can compensate for the fact that the owl's habitat is being eliminated.

These articles originally appeared in The Alliance, a Corvallis-based regional networking newspaper and a publication of The Oregon Coalition of Alternative Human Services, P.O. Box 14742, Portland, OR 97214.

Old Growth Resources

-National Wildlife Magazine, Feb-March 1988

-Audubon Magazine, March 1986

Climax Forest Activities

from Project Learning Tree
Supplementary Activity Guide
for grades 7-12

Ask your students to establish a definition for "climax forest".
If possible, visit several types of vegetative areas with your students. Ask the students to record evidence of plant and animal communities in each area. Have the students identify and discuss the stages of vegetative development in each area. Using that information, discuss questions such as the following with your students:

-What is the climax forest type in your region?
-What impact, if any, have people had on this forest, for example, changing it from a climax type to other stages of succession?
-What, if any, are the advantages of climax forests compared to other types of forests? What are possible advantages and disadvantages for wildlife, for water production and use, for human recreation and leisure-time activities, for commercial uses such as grazing and timber production?
-What is the relationship of climax forest types to fire? Has human control of fire affected development and maintenance of climax forests?

Related to this discussion and any additional research involved, suggest to the students that they create a mural showing the stages of succession characteristic of the vegetation in their region. They might graph the numbers and types of different plant and animal species present in each stage, comparing them in [illegible] discussion.

-What stage of succession appears to have the greatest variety of plant species, of animal species?
-Which stage appears to have the least variety of plant and animals species?
-Are there any plant or animal species [illegible] common to all stages; if so, the [illegible] of these species to the final climax?
-What happens to some animals and [illegible] of forest vegetation types when succession changes?

Can the climax finally be considered a climax vegetation type?

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Eco-Tripping Activities

These activities are from Eco-Tripping, a publication of the Environmental Education Project. The illustrations shown here are not a part of the book. They were drawn especially for this issue of Clearing. For ordering information, see page 31.

Illustrations by Jane [illegible]

ANYPARK, U.S.A.

Anypark U.S.A. is right outside your door waiting for you. It is the old cemetery across the street. It is the vacant lot next door. It is the stream that runs through your playground. It is even the front lawn of your school! We invite you to further explore other inviting green areas right in your own neighborhood. Use the suggestions below to help you plan your trip.

ADDRESS	First identify where you want to go and think about how you will get there with your students. Be bold and imaginative! A class of fifth graders can walk two miles in less than an hour.
OWNED BY	Find out who owns the area you will be studying.
CONTACT PERSON	Call the owners of the area and explain what you would like to do and when you want to go there. Rangers, caretakers, etc., like to know who is using the land.
HABITATS	Take a walk around the site and identify the major habitats. Draw a rough trail map that indicates the locations of forested areas, meadows, lawns, ponds, streams, or whatever is abundant and unique to this area. Include restrooms, trails and picnic areas on this map for your own reference.
SUBJECT AREAS	Decide what subject areas you would like to teach. In other words, "What do I want my students to know after studying this site?" Base this on the unique features you have identified in the previous step. Think also about what you are studying in the classroom and how you could relate your field experiences to your classroom work.
SEASONAL	Be aware that there is great variation in the resources available at a site due to seasonal changes. Fruits come and go, leaves fall off and streams dry up. Plan for these changes by asking people that live near the area, but most importantly, visit the site before you go!

SPECIAL POINTS OF INTEREST

1. Talk to rangers, neighbors, gardeners, naturalists, or others who have visited the site and get their input on special places to investigate.

SUGGESTED FIELD TRIP PLANS

1. Decide how much time you have to spend in the area. Plan for traveling time to and from. Some sites need more time for exploration than others. Don't drag your class across town for an hour's exploration of a large park.

2. Select activities that would be appropriate for the area.

3. Write up a specific, minute by minute outline of the day. Plan for time between activities for hiking, talking and casual observation and discovery. Don't worry if your planned schedule proves impractical. Spontaneous discovery and excitement are the most important factors on any field trip.

4. Picture in your mind where each activity will take place. You may want to return to the site once more to envision where each activity will occur. Jot down notes on your rough trail map.

STREAM ANIMAL INVESTIGATION

GRADE: 3-6
TIME: 45 minutes

DESCRIPTION In this activity students use homemade nets to hunt for animals (insects, crawdads and fish) living in the stream.

MATERIALS Nylon stocking nets - one per child
Milk carton holding tanks - one per every other child
Hand lenses - one per every other child
Towels would be nice for students who get wet.

BEFORE YOU GO

1. Make nylon stocking nets and milk carton holding tanks.

2. Study stream animals, water striders, crawdads, mayflies and trout.

PROCEDURE

1. Explain safety rules: no wading above knees, shoes on, buddy system, boundaries, beware of glass.

2. By the side of the stream, discuss various aspects of the stream habitat (moving water, rounded rocks, waterfalls, meanders, eddies, pools of deeper water).

3. Have students close their eyes and imagine themselves to be an animal living in the stream. What is it like to live here? How do you survive with all this water flowing over you all the time?

4. Demonstrate the proper use of the dip nets. Hold them downstream from rocks. As you lift the rock, scoop up what is underneath. Examine the rocks for insects crawling underneath them. Replace rocks exactly where you found them.

5. Set the boundaries of how far upstream students may go and how far downstream they may go. Post an adult at each of these points if possible. Also, tell students how deep they may wade.

6. Send students out in teams of two making sure each team has at least one net, holding tank and hand lens.

7. Spend a half hour to forty-five minutes collecting animals. Teacher should move around to different teams showing interest in discoveries and helping get slow groups started.

8. After enough exploration time has been given (when interest fades), call groups back together to share findings.

9. One suggested sharing routine is to have each team select one animal they found and introduce it to the class, listing some of the interesting characteristics that they noticed about this creature. Place special emphasis on how this animal gets along in the stream environment.

FOLLOW-UP 1. Write a story pretending to be one of the animals that you found in the stream. Describe your life, your ways of getting around, what you do all day, how you were discovered by these strange creatures that called themselves people.

2. Compare life in a stream to life in a pond.

3. Study local streams around your home and school. Keep a journal of your feelings.

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IT'S A SMALL WORLD

GRADE: 3-6
TIME: 45 minutes

DESCRIPTION [illegible]

MATERIALS
[illegible]
[illegible]
[illegible]
[illegible]

BEFORE YOU GO

1. [illegible]

2. [illegible]

PROCEDURE

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

TIPS [illegible]

FOLLOW UP

1. [illegible]

2. [illegible]

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[illegible]

GRADE: 3-4
TIME: 30 minutes

DESCRIPTION In this activity, students explore the forest floor for small animals that may be crawling about. Slugs, snails, ground beetles, centipedes, millipedes, and a variety of insects can be found. These are collected and put into holding tanks to study locomotion, and then are released.

MATERIALS Milk carton holding tanks. (These are half gallon milk cartons, stapled shut with one side cut out.)

BEFORE YOU GO Make holding tanks.

PROCEDURE 1. Discuss with the class how the forest is like an apartment house. Discuss who lives in the basement, who lives on the first floor, who lives in the canopy (the penthouse).

2. Divide up into exploring pairs. Each pair should have one holding tank between them.

3. Send your class out on their hands and knees to see and find as many different animals that are crawling on the forest floor as they can. Use of hand lenses here is optional.

4. After 15 minutes, call everyone back together to share their discoveries. Each [illegible] should pick one animal and observe it, sketch it and find out as much as he or she can. [illegible]

5. Release the animals. Be sure to return them to the place where they were found.

TIPS When you send the students out, caution them about unnecessary destruction of the forest habitat. Turn back over the logs and rocks that they overturn; watch for [illegible] damage to plants and [illegible].

FOLLOW UP Take a 100 centimeter [illegible] string on your playground and record all animals that you find living along this string.

WANTED!

A Process for Infusing Environmental Topics into the Existing Curriculum

The Infusion Process

[illegible]

Step 1. [illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible]

Step 2. [illegible]

Step 3. [illegible]

Step 4. [illegible]

Step 5. [illegible]

Step 6. [illegible]

- [illegible]

Step 7. [illegible]

Step 8. [illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
1. [illegible]		[illegible]
2. [illegible]	[illegible]	
3. [illegible]	1. [illegible] 2. [illegible]	[illegible]
4. [illegible]	[illegible]	[illegible]
5. [illegible]	[illegible]	1. [illegible] 2. [illegible] 3. [illegible] 4. [illegible]
6. [illegible]	1. [illegible] 2. [illegible] 3. [illegible] 4. [illegible]	1. [illegible] 2. [illegible]
7. [illegible]	[illegible]	1. [illegible] 2. [illegible]
8. [illegible]	[illegible]	1. [illegible] 2. [illegible] 3. [illegible]

[illegible]

[illegible]

[illegible] Environmental Education Site and [illegible] Middle School

[illegible]

[illegible]

Students and adult supervisors from Campbellton School in British Columbia release coho salmon fry raised in classroom aquariums into nearby Kingfisher Creek.

A Celebration of Salmon in Campbell River Schools

by Jim H. P. Nash
Education Coordinator
Quinsam River Salmon Hatchery

Picture the worst possible scenario for people (and probably the best for ducks). A coastal downpour with a group of muddy soggy people standing waiting in the rain. It looks like a funeral scene from a Fred Fellini movie.

But listen! A cheerful, boisterous choir is singing, "The Coho Rush silver all over the bay..." as school children carry plastic bags filled with water and small coho salmon fry down to Haig-Brown's Kingfisher Creek.

"What's happening?" A celebration of salmon. The grade five class from Cambellton School is releasing fry raised in their classroom aquarium.

There is quite a crowd gathered who don't seem to notice the rain. All are happy. Some even have a tear or two of joy in their eyes.

One of these people is Ann Haig-Brown, widow of the famous naturalist and author, Magistrate Roderick Haig-Brown. She is carrying on his tradition with her dedication to educating school children to respect the environment.

The Salmonid Enhancement Program is alive and well in Campbell River!

It was Roderick Haig-Brown whose dream it was that every school in Campbell River should adopt a stream.

This is just part of the program being run in Campbell River by the School District and Fisheries and Oceans (Canada) and which has been awarded a *Fund for Excellence* grant from the Government of British Columbia to continue with Pacific Salmon and Trout studies in Campbell River.

The Quinsam River Salmon Hatchery is being used as a teaching centre and to develop programs adaptable to other coastal communities in B.C., which should be beneficial to science curricula everywhere.

The program packages are prepared from a multidisciplinary perspective (skills related to Science, Social Studies, Geography, Political Science, English, Reading, Philosophy, Economics, Art and Music). They provide opportunities to develop a sensitivity and appreciation for the delicate balance of the environment through "hands-on" learning about fish through actual experience. Hatcheries are living classrooms. Hatchery tours highlight all studies featuring comparisons of wild and artificially-raised fish.

Materials include illustrations and graphic materials on life cycle, economic impact, food chain, recreational benefits. Units provide exposure and orientation at the elementary levels, add depth to curriculum at the Grade 8-10 levels (Science Probe), as well as specific studies in the Biology 11 and 12 levels.

Activities include classroom incubators, adopting streams, stream studies, conservation, enhancement, animal husbandry, environmental issues.

All current and future educational materials are being piloted by practising educators in District #72.

Thanks to Arlene McLaughlin for encouraging the writing of this article.

BIOLOGICAL DIVERSITY

Produced by the Global Tomorrow Coalition, Amy Hahn, Education Director

By the end of the twentieth century, we are likely to lose at least one million species -- more than all the mass extinctions in geologic history , including the loss of the dinosaurs.

Plants and animals are vital to human survival. They produce foods, medicines, and raw materials. They also provide services such as pest and flood control and the degradation of waste.

Habitat destruction is the primary cause of extinction.

An adequate system of parks and reserves, guided by an overall conservation strategy and coupled with well-conceived programs for sustainable economic development and limiting population growth, could preserve our planet' biological diversity.

The Issue

No one knows with certainty how many species presently exist. Some scientists estimate that the world contains as few as five million species, others, as many as 30 million. Whatever the actual total of species on the earth, we are likely to lose at least one million by the year 2000, when the rate of loss could reach 50,000 species each year. This would amount to a biological debacle greater than all mass extinctions in geologic history - even greater than the disappearance of the dinosaurs.

Conservation of biological diversity is vital to human survival and well being if for no other reason than that wild species of plants, animals and other organisms provide people with important products. These include food, medicines, and industrial raw materials, as well as services such as pest control, flood control, and the degradation of waste. The hundreds of thousands of the earth's species that will become extinct in the next 20 years will be lost because we are destroying their natural habitats and excessively hunting their populations. Tropical forests and coral reefs, which contain the greatest variety of species, will lose the most. The majority of lost species will be plants, insects, amphibians, and fish, but significant numbers of birds, reptiles, and mammals will also be lost. Thousands of these species will disappear before scientists even have an opportunity to describe them.

In addition to the species that will be lost outright, many thousands will be reduced to populations teetering on the edge of extinction. When a species becomes rare, it becomes subject to a large number of factors that threaten its long-term survival. Small, isolated populations are highly vulnerable to habitat destruction, changes in climate, disease outbreaks, human exploitation, and political upheavals.

Major Causes of Species Loss

Habitat destruction is the primary cause of extinction. Human population is expected to increase by nearly 50% in the next 20 years, primarily in the tropics; and, as the number of people grow, more areas of forest, savannah, and desert will be converted to cropland. The need for fuelwood will cause other forests to be cut. Growing demand in the United States, Europe, and Japan for hardwoods, beef, lumber, and paper pulp will put additional pressures on the tropical forests. The habitats within shallow coastal areas and coral reefs are also threatened. These estuaries and marine areas, which serve as nurseries for commercially important fin and shell fish, are being damaged by siltation, dredging, and pollution from petroleum and other chemicals.

Biological pollution is another cause of extinction. When humans bring exotic (non-native) animals or plants into an environment, the native species may not have evolved appropriate defenses, and the introduced species edge out the native ones. This is a particular problem on islands, where many native species have evolved in complete isolation from certain predators. In Hawaii, for example, 40% of the native flora is considered extinct or endangered, due to a combination of habitat loss and predation by exotic species, including cattle, goats, and rats. A third cause of extinction is excessive harvesting. Rhinoceros are killed for their horns; blue whales are sought for their oil; sea turtles are hunted for their eggs, leather, shells and meat; and cacti are collected for their decorative shapes. In some cases, one species is depleted during the harvesting of another species. For instance, porpoises, sea turtles, and sea birds are often snared in commercial fishing nets.

The diversity of biological species is the earth's most important natural resource.

The Importance of Biological Diversity

The diversity of biological species is the earth's most important natural resource. Humans depend on the wide variety of species in healthy ecosystems for air to breathe, water to drink, and the productivity of the soil in which to grow food. Green leaves absorb carbon dioxide and release oxygen during photosynthesis. The root systems of plants regulate stream flows and groundwater levels, cleanse pollutants from surface waters, and help recycle soil nutrients. These processes are facilitated by other species, such as worms, insects, fungi, and soil bacteria. Insects are also important as pollinators; 90 of the United States' most important crops are pollinated exclusively by insects. Wild birds and parasitic insects prey on insect pests. While we lack the scientific knowledge to determine which and how many species can be eliminated before a given system deteriorates significantly, we do know that if the current rate of extinction continues, we

BIOLOGICAL DIVERSITY

will lose those free services that make possible life as we know it.

Although laboratory synthesis has freed us from total dependence on wild plant and animal species for organic chemicals, they still provide us with important products, including food, medicine and industrial raw materials, as well as luxury goods. Less than 20 plant species provide 90% of the world's food; three of them - corn, wheat, and rice - constitute 75% of the food supply. Plant breeders have to strive constantly to improve these crops genetically in order to make them resistant to pests that have evolved to prey on them. The most important sources of such genetic material are the wild or locally cultivated relatives of these crop species, which are found where they were originally domesticated. Most of the remaining populations of wild and local varieties exist in Third World countries with the tropical zone.

Today over 40% of the prescription drugs sold in the United States contain chemicals derived from wild species. About 25% of these drugs come from plants, another 13% come from fungi and bacteria, and 3% come from more complex animals. Among the currently used drugs derived from wild species are Digitoxin and Digoxin, originally derived from the foxglove or digitalis plant, used to treat heart disease; and Vincristine and Vinblastine, from the rosy periwinkle, used to treat Hodgkin's disease and other cancers. Some antibiotics, such as penicillin, are derived from bread mold. Marine organisms are considered by scientists to be a still untapped source of new chemicals for the study and treatment of disease.

In addition to the many practical reasons for ensuring the survival of species, a psychological and philosophical basis exists for preserving biological diversity.

Many essential industrial products or raw materials are derived from wild plants, and a smaller number from wild animals. Still others come from semi-domesticated plants, and so are highly dependent on their wild relatives for genetic improvement to enhance their economic productivity or usefulness. Timber and other wood products, including lumber, paper, and wood-based chemicals such as resins, are the most economically important category of industrial products derived from living resources. The worldwide value of all forest products was about $115 billion in 1978.

Rubber, another major industrial product, is derived from trees. While a synthetic substance has been increasingly used since its invention during World War II, natural rubber constitutes about one-third of current world use because of its superior qualities. Over 70% is used for tires - mostly heavy duty tires for airplanes, trucks, buses, and off-road farm and construction equipment, as well as radial tires for cars.

A liquid wax that is vital to industrial machinery subjected to high speeds and pressures is derived from wild diversity. The wax is also used in automobile transmissions. Its only source was the oil of the sperm whale until scientists recently discovered that the seeds of the jojoba bush contain a liquid wax not only equivalent to sperm oil in its lubricant properties, but superior because it contains few chemical impurities. In addition, jojoba wax requires little refining for most industrial uses.

In addition to the many practical reasons for ensuring the survival of a diversity of species, a psychological and philosophical basis exists for preserving biological diversity. Many people seem to have a psychological need to observe, admire, photograph, collect, or be surrounded by diverse living things. Many feel that it is morally wrong to allow or force a species to become extinct. They hold that to do so not only unjustly deprives future generations of their right to enjoy the possible benefits of that species' existence, it also violates that species' right to exist. The ethical and legal debates over the rights of non-human life are complex, but it is a fact that a reverence for all life is fundamental to many religions and moral systems. Even in today's predominantly secular society, the uniqueness and inherent value of life are deeply felt by many people.

Species Conservation

The greatest variety of species exists in developing nations within the tropical zone. Although these countries are rich in genetic resources, they have low per capita incomes, and they need technical and financial assistance from wealthy nations for protecting and managing these biological resources. There are several approaches to conserving species and biological diversity:

- Protecting species of recognized value or those known to be in danger of extinction, through provisions such as the U.S. Endangered Species Act, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and the International Whaling Convention.

- The so-called Noah's Ark strategy in which samples of species judged most important are collected and kept in a safe place, such as a zoo or gene bank.

- The establishment of biological reserves that protect entire ecosystems. This approach conserves not only those species that draw public interest, but also the less conspicuous plants, animals, and microorganisms on which they depend. Proposed

Protected areas can provide benefits such as control of soil erosion and maintenance of air and water quality.

[illegible]

More protected areas are urgently needed; our present network is less than one-third of estimated needs.

Protected areas

[illegible]

[illegible]

Conventions and Treaties

[illegible]

[illegible]

A Global Strategy

[illegible]

- Plant and animal populations must be helped to retain their capacity for self-renewal.
- The world's basic life-support systems, including climate, the water cycle, and soils, must be [illegible]
- Genetic diversity, a major key to our future, must be maintained.

[illegible]

BIOLOGICAL DIVERSITY

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A global treaty is needed to protect critical habitats, under which each nation would accept responsibility for species within its borders.

What You Can Do

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Further Information

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Articles, Pamphlets, Brochures, and Directories

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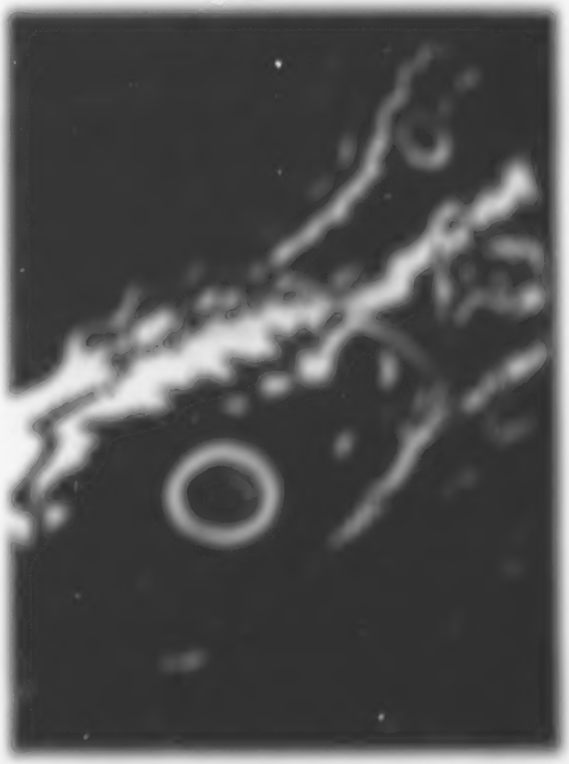

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Hazardous Wastes in the Home

For Hazardous Waste - There's No Place Like Home

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Sample Activity:

What's Hazardous in Home?

[illegible]

Sample Activity:

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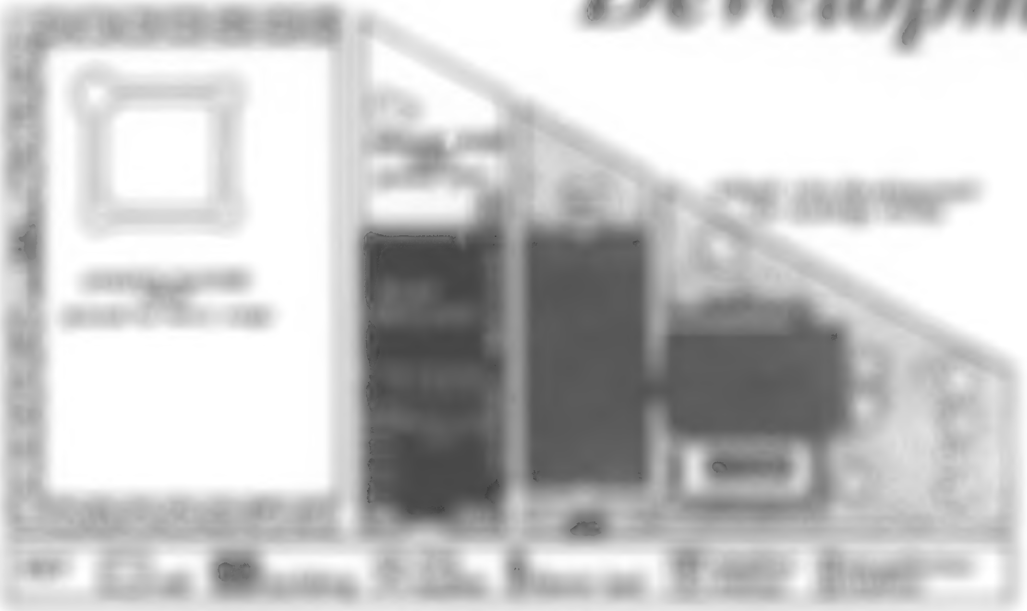
School Site Development



School Site Development

[illegible]

signs. All should have some degree of involvement.

4. Students should do as much of the actual work as possible.

Projects

1. Grass Seeding - Areas where grass has worn away due to traffic patterns or ball playing can be reseeded, and alternate use of the area can be planned until grass grows.

2. Ground cover, ivy or carpet junipers, can be planted on eroded areas.

3. Trees, shrubs or bushes can be planted in strategic locations on the ground: a wind break in front of a dusty playing field, a flowering dogwood in the corner of a courtyard, evergreens as a border of a driveway or a large deciduous shade tree in front of a sunny window.

4. Flowers can be planted in almost any conceivable spot. Experiment with patterns such as circles or rectangles. Plan ahead for springtime by planting tulip, daffodil and crocus bulbs in the fall. Flowers can be planted from seed directly into the ground, or they can be started in flats in the classroom and transferred outside at the appropriate time. If planting in a semi-shaded area, be sure you choose an appropriate plant.

5. If outdoor space is a problem, build simple flower boxes to put in the windows of the classroom or school - perhaps the custodian or a parent could help with their placement.

6. A portion of the school grounds might be allotted to mini-gardens. Mini-gardens can contain vegetables, flowers, combinations of both or even a vegetation study area depicting a forested region, grasslands, desert or cropland. Keep in mind that this can be accomplished in a minimal area as small as 200 square feet. These mini-gardens can also be started in very early spring in the classroom. Any type of containers can be used - bushel baskets, pails, buckets, cardboard boxes lined with plastic, planters of any type. Be sure the containers have drainage holes and are not overwatered. Classroom mini-gardens have the advantage of being mobile to follow the sun. Railroad ties piled into box form, filled with soil, mulched, and trees, shrubbery or flowers can brighten urban school blacktop areas.

7. The upkeep of planted areas on the grounds can be undertaken by weeding and mulching under trees and bushes. Wounds in trees may be treated with creosote to prevent insect damage.

8. Chalk marks and graffiti on the outside of buildings are an increasing problem. A wash-up, paint-up, sweep-up project with sponges, brushes, and paint might help. There are commercial "graffiti remover" cleaners on the market as well.

Reminders:

Whatever projects are undertaken, be sure that a photo record is kept of "before," "during" and "after" activities. If slides are used, they could be the focal point for a school assembly to motivate participation on a school-wide basis. *They could also be contributed as an exciting article in a future issue of CLEARING. - Ed.*

VACANT LOTS - VEST POCKET PARKS - URBAN TRAILS

If the school site is inadequate for your plans, look for a vacant lot in the vicinity. If using a vacant lot or private property, permission must be secured from the owner. Arrangements should be made for insurance or statements of liability by the school stating that the study area would be treated as any school area and that the owner is in no way be liable for accidents. It should also be noted that the children would not use the area except under supervision and that nothing would be cut or destroyed. The owner should be thoroughly apprised of the types of activities to be undertaken.

The entire process of obtaining permission, setting up ground rules and, of course, thanking the owner, should be the responsibility of the students.

In an urban area where parks are often at a minimum, the possibility of developing a vest-pocket park might be explored. City, state and federal funds are often available for communities that want to establish small neighborhood parks. If land is available and the need for such a park exists, it might be possible for the students to conduct a campaign to gain support for the idea. The curriculum possibilities are endless in such an activity:

-in language arts, letters to the mayor and other elected officials suggesting such a park, making a proposal, planning the park, talking to people in the community.

-in mathematics, determining the size of the area, making cost estimates, mapping.

-in science, what plants and trees are already there? What other planting would be compatible?

-in social studies, how would the park benefit the community? How do people feel about a park? What problems might there be? How could they be overcome?

Another project for city schools could be to construct a planned walk in man-made surroundings. Just like a nature trail, a city block is composed of air, earth, water and populations. You can see variations of these elements in any man-made setting. Instead of plants and trees, one observes houses, telephone poles, signs. Instead of animals and insects, one observes people and their habits. Instead of noticing how the natural elements interact to bring growth and change in a nature trail, one considers how the patterns of electric lines, sewage units and general city planning ensure man's adaptation to his environment. Local city planners can provide valuable assistance in creating your urban environmental trail. Children can analyze the needs of people living in the city and determine how and if these needs are met.

This article was reprinted from A Better Place to Be: A Guide to Environmental Learning in Your Classroom, by Carol Euston, printed by the U.S. Department of the Interior.

Dogfish Tagging:

A High School Research Project at Campbell River Secondary School

by Van Egan and David Brown

"The spiny dogfish is not usually regarded by British Columbians as a thing of beauty, nor of any great value. But mention Squalus acanthias to certain secondary students in Campbell River and they are likely to reply with a history of their three year love affair with one of the sports fisherman's greatest enemies." (Education Today, Vol. 3, No. 7, April, 1977)

Students from Campell River Secondary School pull in a Dogfish to be tagged as part of their involvement with the Pacific Biological Station and the Department of Fisheries off the coast of Vancouver Island.

The Program

The dogfish tagging program began in 1975. We had no idea that it would become an eleven year project involving 700 students who would tag more than 20,000 dogfish! Its purpose was to give Campbell River high school biology students practical research experience in the field and experience in working with large volumes of data. Catching, tagging and releasing animals with the possibility of eventual tag recovery is naturally interesting to students. Also, because dogfish have not been researched extensively, dogfish tagging gives students (and teachers) the satisfaction of gathering information not already known. The primary objective was to determine the growth and movements of dogfish in the Strait of Georgia.

Participation

As many as eighty students and five teachers per year have taken part in the program. From the beginning, three Department of Fisheries and Oceans biologists of the Pacific Biological Station (PBS) in Nanaimo, B.C., have been of great help. Their encouragement and scientific expertise has stimulated interest in the program among students as well as in the community and with school trustees. A local commercial fisherman has provided his boats and fishing skill at low cost.

Funding

The Campbell River School Board totally funded the project for its first three years. In preceding years, the Department of Fisheries and Oceans has agreed to provide boat, funding, tags and the services of two Pacific Biological Station consultants. Our School Board continued to fund our substitute costs (usually a total of 10 days) even during our infamous "restraint" years in B.C. Groundfish investigations are gaining in importance at the Department of Fisheries and Oceans, and our dogfish tagging program tied in with a larger one conducted by the PBS in 1980.

The funding comes by way of a service contract and may specify a particular experiment. One of our projects was to conduct an experiment on the best hook size for catching dogfish. In the past we have felt some concern that the #2 halibut hook we use on our longline has damaged the dogfish and perhaps missed catching smaller individuals in the population. In subsequent years we experimented with 3 different types of tags and an injection of oxytetracycline near the dorsal spine for age determination.

Tagging and Tag Recoveries

Using longline gear in the Campbell River area, students tagged more than 5,000 dogfish in the first three years. Our recovery rate was very low - only eleven tags had been returned to us - which indicates that tags may be lost from the fish.

On considering the probably tag loss problem, we suspected that the rough skin of the dogfish abraded through the nylon stringer that attaches the tag to the fish. Consequently we experimented with three types of tags to determine the relative rates of tag return they provide. In addition to the Floy tag (a plastic and nylon, spaghetti type tag), we used the Peterson disc tag, once widely used on salmon, which consists of two plastic discs connected to the fish with a wire stringer, and a third, experimental type of tag designed to resist abrasion. Each dogfish was tagged with a combination of the three tags. We retained the latter tag, and used titanium pins to attach it.

Signs noting the tagging program are posted in the Campbell River area (see example). By December, 1985, more than 360 fish had been recovered. There were some long distance examples, but the majority (70%) remained in the Strait of Georgia; about 20% were recaptured north of the Strait; about 8% in Puget Sound and Juan de Fuca and about 2% moved to the west coast of Vancouver Island and Washington. Each tag recovery is a particularly exciting event for both students and teachers; and even after graduation, students inquire about recent recoveries.

Data Analysis

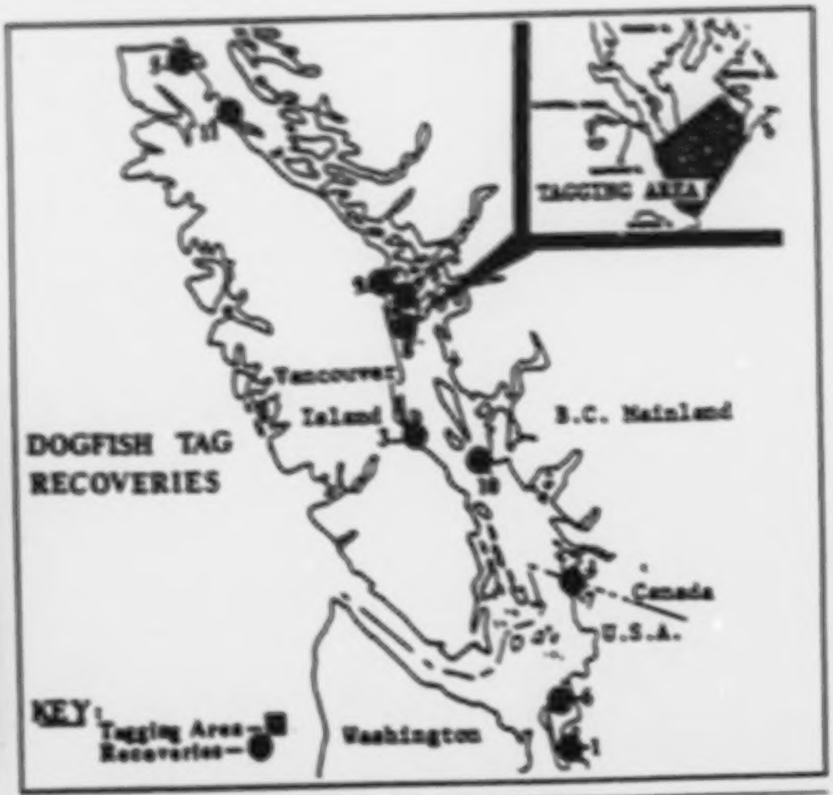
Using data collected over the years - such as length, weight, sex, depth of capture, stage of tide, number of bare hooks returned - students learned how and for what purpose they can analyze the data. All results are recorded on a standardized form used by the Biological Station. These in turn are published in Canadian Data Reports of Fisheries and Aquatic Sciences. A sample graph is enclosed that illustrates a significant size difference between males and females.

Education and Science

Few activities have captured the imaginations of students so much as dogfish research. It combines the actual participation in a tagging program with the generation of some data that could be useful to the management of British Columbia's fisheries.

There have been two important spin-offs as well. Dogfish as a food source has been investigated by two students who prepared several dishes. The results were excellent and proof that the dogfish can be a fine table fish. And student attitude toward the much maligned dogfish has undergone a remarkable transition. No longer is Squalus some kind of evil persistent pest, but a respected member of the ocean community.

(Above) Student records data as part of the Dogfish tagging project undertaken by Campbell River Secondary School students. Data appears in government reports. (Below) Student holds recently tagged Dogfish. Released fish will be tracked to understand movement of fish.



Holcomb Habitat Environmental Education Site

Holcomb Elementary School,
Oregon City, Oregon

by Susan Zielke and Sheila Ford

In 1985, the Parent-Teacher Club at Holcomb Elementary School, on the outskirts of Oregon City, Oregon, began a five-year project to turn what was then a seemingly unsolvable problem with water drainage on the eastern portion of their school grounds into an outdoor classroom. Here the students could be taught about their environment, wildlife, and nature. School budget cuts had eliminated the Outdoor School Program and it was hoped this project would replace that opportunity for learning.

For a number of years, the Oregon City School District spent thousands of dollars in an attempt to solve the run-off problem caused by the school sitting on a hillside with poor drainage. Even after these attempts, the district still had pools of standing water with tadpoles and frogs.

A proposal was made by two parents, Susan Zielke, who was involved in teaching students and teachers at Holcomb School how to recycle, and Sheila Ford, then President of the Parent-Teacher Club, to stop fighting the drainage problem and turn it into a wetlands habitat.

Plans were drawn up by the John Inskeep Environmental Learning Center to turn the natural drainage problem into an asset, as well as develop an area of native Oregon plants that would attract wildlife and serve as a classroom for learning about the effects of man on the environment.

The actual size of the first phase of the project is over two-thirds of an acre, and was completed December of 1986. A large wetlands pond was excavated, lined with river rock, and fed by water that had previously caused the drainage problem. The work on this project was done during weekend work parties by the families of the school (parents and children alike), Boy Scout troops and Cub Scout packs, as well as some classroom involvement during the week.

The poor quality of the soil required a great deal of amendment. Rotted sawdust and horse manure from a nearby horse stable were brought in and spread two-inches deep over the entire area. The site was tilled and excavated, forming the pond, a streambed, and planting mounds in an effort to make it all look as natural as possible. A drainage ditch from previous efforts at solving the problem was intercepted and used to both feed and drain the pond and stream.

Three students at Holcomb Elementary School in Oregon City attend to a newly planted tree in the environmental learning site created at their school. The John Inskeep Environmental Learning Center played a significant role in helping develop the plans for the site.

The plants were selected to represent native Oregon trees and shrubs, as well as to attract wildlife. Many plants were "sponsored" by families and they will have plaques naming both the plant and the sponsor. Other plants were donated by growers or nurserymen in the area. When the actual planting was done, additional amendments were added to the planting hole. To help create a more natural look, the entire area was covered with composted yard debris, rather than the usual barkdust. Basalt boulders were added throughout the area which enhanced the natural look.

The whole school community became a part of the Holcomb Habitat at a dedication held December 4th. Everyone took part in planting the final tree - a Pacific Dogwood. The children all brought a small bag of soil from their home to put around the tree. They were then given a Douglas fir seedling to take home and plant in their yard. The Holcomb Habitat name was selected by a vote of the school community from names submitted by students.

Volunteered man-hours valued at $7000 were logged in this effort. Donations of equipment and materials have topped $3000. The Holcomb Parent-Teacher Club has raised funds through various school activities contributing $3700 toward the project. Upon completion, the project will have an estimated value of $15,000.

Future plans for the site include three additional phases: a waterfall to channel run-off flow into the pond, a bridge-walkway across the wetlands pond for close observation of plants and wildlife, and paths through plantings of native conifers on the hillside above the wetlands. A number of the specific elements of the Holcomb Habitat have been done by Boy Scouts for their Eagle rank advancement. Local youth groups and classrooms have been encouraged to take an active role by providing birdfeeders, houses, bulb planting and maintenance.

Is your classroom or school involved in a project in environmental education like these that you can share with readers of Clearing?

Help Clearing share ideas and success stories from around the Pacific Northwest. Send your article, accompanied by black-and-white photos, to Clearing, c/o Environmental Education Project, P.O. Box 751, Portland, OR 97207, or call us at (503) 229-4721 to discuss your idea.

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Cherry Springs Nature Area
Pocatello, Idaho

by Shirley Wright

Cherry Springs Nature Area, located about five miles south of Pocatello, was developed in cooperation with the U.S.Forest Service and the Environmental Educators of Southeast Idaho. It is reached by a paved road which is kept open year-round. In a graded area next to the road, there is adequate parking for several cars and school buses. The site, part of the Caribou National Forest, was once a campground which had been closed due to excessive vandalism and a contaminated water supply. The campground's asphalt road was still partially intact. Mink Creek runs through the area and is frequented by fishermen and wildlife. Over 150 species of birds have been identified here.

One of the recommendations made in the long-range management plan for the Caribou National Forest was that this site be developed into a nature study area. Carl Linderman, Recreation Specialist for the Caribou National Forest, suggested this project to the Environmental Educators of Southeast Idaho, a group of local teachers and Idaho State University faculty. Our group eagerly adopted the task of planning and constructing a trail, writing a trail guide, and planning in-services to acquaint local teachers with the resources of the area.

Several members of the group explored the site in the fall of 1985 to make a tentative plan for the trail. Some preliminary flagging was done at this time, but actual construction of the trail was begun in the spring after snow melt. Many volunteer groups helped in the construction, including Boy Scouts and service organizations. The committee responsible for the trail guide walked the trail several times brainstorming ideas for the stations into a tape recorder. The. guide, written using the ideas generated on-site, uses an investigative approach and is designed to be usable by children and adults.

Trail construction and the guide were completed in late September, just in time for an on-site, day-long teacher in-service. The morning of the in-service was devoted to an exploration of the trail and participation in various EE activities most appropriate for specific stations. During the afternoon, there was a choice of the Water Investigation or Animal Investigation using the U.S. Forest Service *Investigating Your Environment* materials. Materials used during the morning included activities from OBIS, Project WILD, and Project Learning Tree. This in-service has been done two different years.

Since teachers sometimes have difficulties obtaining materials for some of the activities, the EE group decided to assemble kits for their use. These kits can be checked out and contain the equipment necessary for a particular kind of study and some resource information for the teacher. Kits are now available for studying the stream, the soil, and trees.

Plans for further development of the area include construction of a small amphitheater on a natural hillside, which will be done this summer. A series of family-oriented evening nature programs are presented during the summer. Other plans include making the trails more accessible to wheelchairs and the construction of an open-sided shelter since the weather is quite unpredictable in the spring - the season of greatest utilization by school groups.

The nature area is in almost daily use during the winter. Some of the factors which have contributed to its success include its proximity to town, ample parking and the publicity and training generated by the in-services. We have been fortunate in having an ideal site and the enthusiastic volunteers necessary to make a dream a reality.

Shirley Wright is a teacher in the Pocatello School District No. 25, P.O. Box 1390, Pocatello, ID 83201
She was instrumental in the development of Cherry Springs, along with Carl Linderman. The Cherry Springs project has been nominated for a Take Pride in America award for 1987.

Douglas Fir

Bald Eagle

The Making of a 16mm Film: A Special Experience for Biology Students

Cleveland High School
Portland, Oregon

by Richard M. Myers, Biology Teacher

What happens when a group of advanced biology students are provided with the resources to make a film of their choice? We found out when the experienctial biology students at Cleveland High School in Portland, Oregon had this opportunity.

In January, 1983 the Northwest Film and Video Center in Portland approached us about making a short 16mm film, using the resources provided by the Center's Video/Filmmaker-in-the-Schools Program. Working together with filmmaker Jim Likowski and animator Lonnie Smith, the students set out to make a biology film of their choice.

By autumn of 1983, the project had produced a 23 minute documentary color film on the natural history of the Columbia River Gorge. Since the premier at the Portland Art Museum's Berg auditorium that autumn, the film has been viewed by many audiences, including a special showing at the Smithsonian's National Museum of Natural History in Washington, D.C. this past summer. The film is a resource in many educational film libraries and continues to receive many requests for showing. Recently, a study guide to be used with the film was designed by a student at Lewis and Clark College.

The film, "The Columbia River Gorge: A Natural History," begins by introducing the ancient geological history of the gorge using clay animation sequences. Contemporary live action footage depicts the special nature of the Columbia River Gorge ecology. The Cascade Mountains physically divide the dryer landscape to the east from the rainy valleys to the west, resulting in a great variance of the climatic conditions throughout the 85-mile long gorge. The diverse environments observed in the gorge produce a wide variety of flora and fauna including many rare and endangered species.

The participation in this project allowed the students the opportunity to investigate the environment of the Pacific Northwest in a unique manner. Not only did they have to investigate the natural history in great detail, but they had to compile this information into a script that would make possible a production to be shared with a diverse audience. The students had to search scientific literature, interview practicing biologists and then had to find suitable sites for recording this information as a visual image. Under the guidance of the artists-in-residentce, the students worked on script writing, camera operation/filming, wrote original music, constructed clay models for clay animation sequences, and suggested many ideas about the message the film should carry.

The result is a product that describes a special environment of incredible intrinsic value. Audiences who view the film are rewarded with an enjoyable experience and a greater understanding of the magnificence of the natural world.

The film is available for rental or puchase through the Circulating Film Library of the Northwest Film and Video Center, 1219 S.W. Park Avenue, Portland, OR 97205.

A second film, focusing on Portland's Forest Park, has recently been produced by Cleveland High School science students. Richard Myer is a science teacher at Cleveland High School, and was named Oregon Science Teacher of the Year in 1985.

Trillium

Is your classroom or school involved in a project in environmental education like these that you can share with readers of Clearing?

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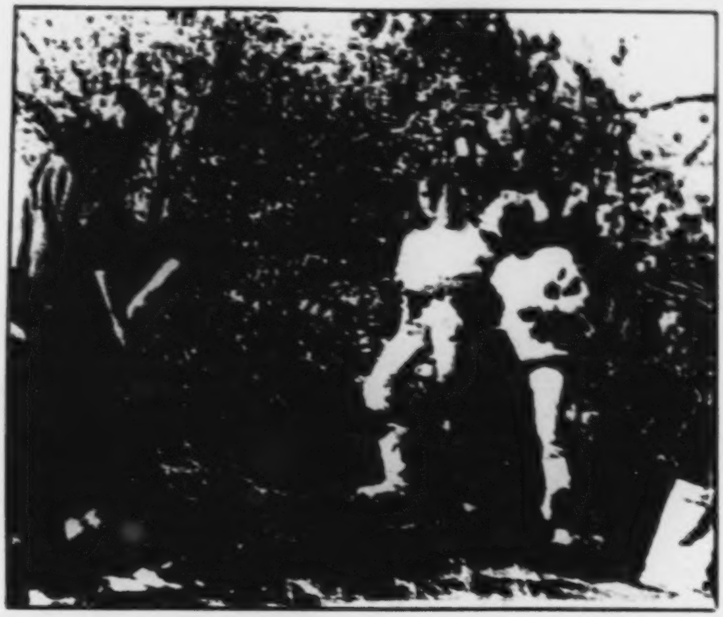
Rogers Senior High School

Spokane, Washington

by Mary Porter and Peggy Burt



As part of a 10th grade biology class, students at John Rogers High School in Spokane, Washington are encouraged to appreciate and protect the air, soil, water and wildlife of Eastern Washington. Many activities focus on local and current environmental concerns. The program continually changes as new concerns arise. Resource people from government agencies, environmental organizations and local colleges provide up-to-date information and ideas for student activities. The students take part in six field trips where they investigate some questions about wildlife or human impact on the environment. In addition, students may do a variety of projects or attend community meetings on environmental issues.

Here are some topics and types of activities included in the biology classes:

1. Lake eutrophication is occurring rapidly in nearby lakes which are receiving excess nutrients, especially from residences around the lakes. In class the students learn how a lake ages and how to recognize different kinds of freshwater algae, including blue-green algae that may be indicators of a eutrophic lake. Then the students go to Liberty Lake east of Spokane where a lake restoration project has attempted to slow the process of eutrophication. The students sample the lake water for study in the classroom and see firsthand the operation of the wastewater treatment plant that was built as part of the lake restoration project.

2. Protection of the Rathdrum-Spokane Aquifer has been a primary environmental goal in the Spokane Valley. This aquifer was formed by glacial gravel deposits. Later the gravel was washed several times by giant floods from the melting of an ice dam holding Glacial Lake Missoula. The aquifer is exceptional in its size and water quality, but because of the porous gravel, it is vulnerable to sewage and chemicals seeping down from the ground above. The students learn about proper disposal of household wastes. Some students have been involved in encouraging their neighbors to take hazardous wastes such as certain pesticides to a hazardous waste collection site provided once a year by the city's Solid Waste Management Department. Also, students have attended hearings concerning aquifer protection and the transport of nuclear waste through Spokane.

3. Air pollution issues include acid rain, wood-burning stoves, radon in homes and a proposed waste-to-energy plant to dispose of the city's solid waste. Students conducted a wood-burning survey to determine if people knew the correct way to use stoves and fireplaces to reduce the amount of smoke produced. Another student placed cannisters in different parts of the school building to determine the radon levels. Other students attended an informational meeting about the waste-to-energy plant and listened to discussion pro and con.

4. Soil erosion and the impact of off-road vehicles are quite evident on a large hill a few miles east of the high school. Beacon Hill is the backyard of the people in this area who use it for hiking, horseback riding, riding off-road vehicles, dumping trash and "keggers." All the land is privately owned. We searched the records at the county courthouse to locate some land we might be able to use for biology studies. Washington Water Power, a local utility, graciously agreed to lease the school 35 acres of forested land for 10 years for $1.00. We take our students to this study site several times during the school year. On two of the field trips to Beacon Hill, the students observe the kinds of plants and animals on the hill and note that some areas no longer support life. They make hypotheses to explain their observations and on the second trip they test these hypotheses. Students usually choose to test the amount of water in the soil, soil compaction, slope, soil temperature or soil nutrients. they find that soil compaction is greater and soil moisture is less in bare areas where off-road vehicles have killed the plants. As special projects, the students have removed truckloads of trash from Beacon Hill and have gone to 6th, 7th and 8th grade classes in nearby schools to start these younger students thinking about the use and abuse of Beacon Hill. To help reduce soil erosion and provide habitat for wildlife, some students have participated in a project with the Department of Game, planting shrubs on marginal farmland.

5. A local insect pest control problem is the apple maggot fly which was accidentally introduced in the Spokane Valley in 1982. Efforts to control the spread of this fruit fly have included restriction of the transport of home-grown

apples, cutting down apple trees and use of the pesticide Imidan. The Department of Agriculture supplies the classes with apple maggot flies to view with microscopes and also supplies updated information about the spread of the flies. The students consider the benefits and hazards of different methods of control of these insects and realize the importance of obeying the quarantine on the transport of home-grown fruit.

6. Wildlife management and wildlife protection issues provide endless opportunities for student involvement. The students go to a local fish hatchery to learn how rainbow trout are raised for stocking in area lakes. The lakes have no streams for natural spawning by trout, yet the lakes are cold enough and have food enough to support trout. The students then go to a lake to catch trout to determine the ages and sizes of the trout. The Department of Game issues the biology classes a special science collection permit for this study. On another field trip, the students sample shrubs in the spring to determine how much food is available to support deer in the study site on Beacon Hill. On another field trip, the students compare the diversity of a natural area with the diversity of a monoculture and learn about the benefits of diversity of wildlife. As projects the students write letters to senators, representatives and government agencies concerning specific threats to wildlife. Some students will be hleping the local Audubon Society protect a heron rookery in a county park along the Little Spokane River.

7. To learn about the ecology of areas very different from Eastern Washington, some of the students take part in two field trips to study marine biology. One of these is an all day study of Puget sound. After sitting up all night on a bus, they spend most of the day on a science research boat learning about life in Puget Sound and some of the threats to that life. The boat trip is followed by a tour through the **Seattle Aquarium** and a marine-related film at the Omnidome Theater. Then they board the bus for the long trip back to Spokane. The other trip, financed by environmental projects, allowed students to camp out on Maui, Hawaii, while studying warm salt water ecology and environmental pressures on Maui. The inspiration and information for this second trip was provided by **Craig McGowen**, biology teacher at **Garfield High School** in Seattle.

As teachers, we find that our curriculum with all of its projects, keeps us on a constant "high." A large majority of our students will remain in this area. We are confident that our students understand many environmental concerns and will want to take an active part in maintaining quality life for humans and wildlife.

Mary Porter and Peggy Burt have been nominated for an award given annually to outstanding programs in conservation by the National Association of Conservation Districts.

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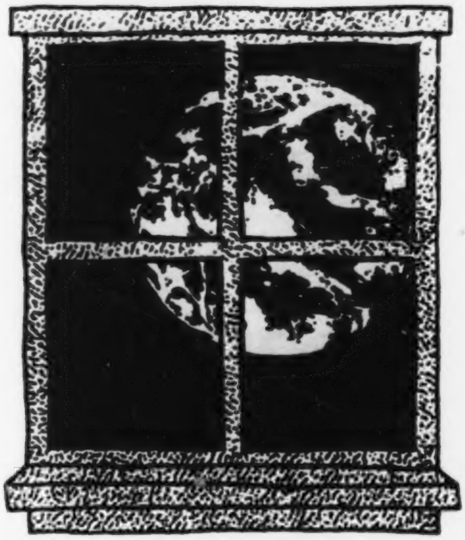
Thinking Like a Planet: The Promise of *Homo custodians*



Noel McInnis

In 1968 I co-authored an anthology of environmentally related articles entitled *Can Humankind Care for the Earth?* Its intended publisher initially declined the manuscript because "nobody else is asking that question." In 1970 the publisher reconsidered, and a modest printing appeared with "man" substituted for "humankind" (Can Man Care for the Earth?: Nashville, Abindgdon Press, 1971).

Although the book is long since out of print, its question has never left my mind. In 1968 I considered the question to be an open one. Today, I feel more definite about an answer:

Can humankind care for the Earth? Yes.
Can *homo sapiens* care for the Earth? No.

I came to this conclusion after reading the description by physicist David Bohm of a power infinitely greater than that of nuclear energy. This power, called zero quantum energy, is uniformly distributed throughout the universe and may be its binding energy matrix. Sudden liberation of the zero quantum energy within any cubic centimeter of the universe, a la a nuclear bomb, might obliterate the entire cosmos.

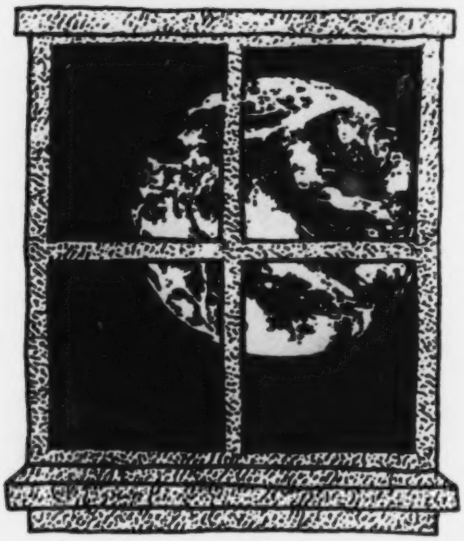
In the 80 years since Albert Einstein revealed the comparatively minuscule power inhering the nuclei of atoms, we have shown scant evidence of being its appropriate custodians. Is our species ready for zero quantum energy?

I suspect not. *Homo sapiens* seems only wise enough to be the long-sought missing link between the apes and truly civilized human beings. At our best we have learned, as Aldo Leopold, to think like a mountain. Caring for the Earth requires human beings who think like a planet. Fathoming zero quantum energy may require human beings who think like a cosmos.

Our species can, at best, minimize its carelessness for the Earth. Such, realistically, seems to be the best possible outcome of our efforts as environmental educators. It will take far more than education, values clarification, attitudinal healing, and personal transformation to produce a custodial species. *Homo sapiens* is no more capable of caring for the Earth than our predecessor species were capable of Los Angelizing the Earth.

Today's environmentalists are therefore not the ultimate planetary caretakers. Rather, we are precursors, a bridge across the evolutionary gap between our species and the one that will succeed us: *Homo custodians*. The persons to whom environmental educators will make the most sense are only now being born in sufficient numbers to assure than humankind may one day indeed "replenish the Earth," thus fulfilling that portion of the Great Environmental Commandment that we have ignored in our eagerness to mulitply, subdue and have dominion (see Genesis 1:28, 9:1).

I do not anticipate that *Homo custodians* will differ from us



physically to the extent, for instance, that we differ from our Neanderthal forerunners. The evolutionary leap before us is a mental/emotional one. The new human species will *feel* as integral to the whole planet as the most sensitive of Native American populations have felt to their local environments. *Homo custodians* will assert an unequivocal "yes" to what Einstein called the most important question: "Is the universe friendly?" To answer otherwise, with cosmic powers at our disposal, is to be inclined toward ending the whole business.

Homo sapiens does not have the sensitivity and receptivity required for planetary custodianship. Species-wide individual and corporate awareness of the long-distant, long-time consequences of local acts requires communication skills more comparable to planetary telepathy than to planetary telegraphy. Fortunately, planetary telepathy is precisely the evolutionary leap for which our electronically "wired" planet is now selecting.

Fitness to survive in an electronic information environment, which functions at or near the speed of light, is a function of one's ability to send and receive information rapidly, accurately, and honestly. What little is known about telepathy suggests that a telepathic species would have excellent adaptability in an electronic information environment. How better to sense the effects everywhere of one's acts anywhere, and thus be capable of thinking like a planet?

John Haught demonstrates in The Cosmic Adventure that science does not necessarily preclude the religious intuition "that the universe is at heart, in its transcendent depths, a graceful, caring, enlivening environment," an environment that is "trustworthy and fulfilling rather than indifferent or hostile toward us." The best that *Homo sapiens* can do is to believe that this is so while minimizing behaviors and actions that seemingly make it otherwise, and to gladly welcome the successor species that embodies its being so.

How will we recognize *Homo custodians* ? Look for those who consistently feel with their minds, think with their hearts, and generate harmonious consequences with modest efforts.

from the proceedings of the Fourteenth Annual Conference of the North American Association for Environmental Education, "Environmental Education: Progress Toward a Sustainable Future," 1985, Washington, D.C., published by NAEE, P.O. Box 400, Troy, Ohio 45373

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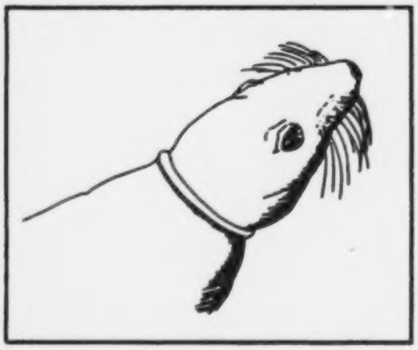
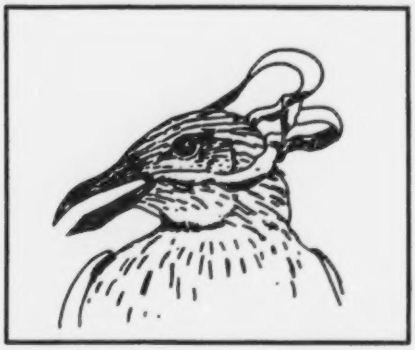
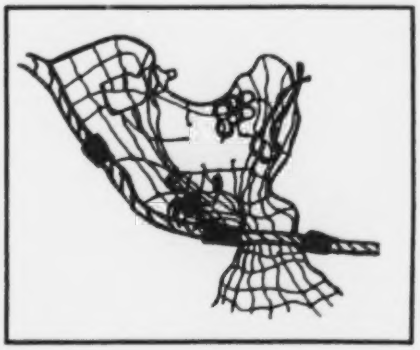
Plastics in the Marine Environment







"Each Man Kills What He Loves Best
Some Do It With A Sword, Some With A Pen..."
-Oscar Wilde

Alonzo T. Pruter

The ever increasing production of plastics is resulting in growing widespread distribution of these persistent materials at the surface and global margins of the world's oceans. The largest inputs of plastics are from ship-generated litter, litter carried to sea by rivers and drainage systems, and litter left behind by beachgoers. Convenience items, packaging materials, fishing gear, and raw plastics comprise most of the synthetic materials entering the oceans.

While further studies would be required to understand all of the biological impacts of plastics on marine life and seabirds, especially at population levels, their physical effects are often very apparent. Birds can become entangled in lines, net fragments, and "six-pack holders." Some species of seabirds swallow plastics which can lead to blockage of the intestine or ulceration of the stomach. The greatest threat to seals and sea lions apepars to be from becoming entangled in lost of discarded fragments of nets, pieces of rope, and uncut bands used to strap boxes and other cargo. "Choke collars" of fish net and uncut strapping bands along with other forms of entanglement are believed to be responsible for approximately 50,000 deaths a year of the northern fur seals of the Pribilof Islands in the eastern Bering Sea.

The stomachs of some fishes, including juvenile flounders off the U.S. Atlantic coast, have been observed to contain large numbers of plastic pellets. Unnderwater observations of derelict ("ghost") gillnets have shown they can continue to catch fishes, crabs, diving seabirds, and other forms of marine life for several years after they are lost.

Ingestion of plastics and entanglement in lines and net fragments can also injure or kill sea turtles. Turtles are known to swallow a variety of synthetic drift objects, including plastic bags and sheeting they may mistake for a normal food source.

Seafarers and fishermen are directly impacted by plastic debris when rope or derelict fish net entanlges and damages propellors and rive shafts, or clogs sea intakes and evaporators. Besides endangering lives, such occurences can cause economic losses in the form of costly tows to port, repairs, and lost time.

According to estimates made over a decade ago, more than 6 million metric tons of man-made debris was being discharged into the world's oceans each year from merchant ships, passenger ships, naval vessels, fishing vessels, pleasure boats, and offshore oil platforms and drilling rigs. With the incrases in vessel traffic, the amount of debris is probably greater today. And to make matters worse, a larger proportion of the debris now probably consists of plastic products.

Plastics in the Marine Environment (continued)

The shift from the use of natural fibers to longer-lasting synthetic fibers for the construction of nets, lines, and other fishing gear has caused commercial fisheries to become a large contributor to plastic pollution. Fishing gear can become a pollutant as a result of accidental losses (fishery-generated) or from dumping (crew-generated). Although the amount of lost and discarded fishing gear is not precisely known, some investigators believe that worldwide it may amount to over 100,000 metric tons per year. Commerical fishing vessels are a source of discarded bottles, bags, sheeting, sytrofoam cups, six-pack holders, and other plastic objects.

Recreational fishing also generates large amounts of plastic litter, especially in the U.S. where in 1985, 80 million angler visits were made to marine waters. Whether done from shore, piers, or boats, sport fishing is a frequent source of discarded bait trays, bait bags, worn or snarled line, and a varioety of plastic convenience products.

In heavily used coastal areas, beachgoers can generate large amounts of plastic litter. For example, the 70 million people who annually visit beaches in Los Angeles County, California, are reported to leave some 75 tons of trash on the beaches every week.

The plastics industry is a diirect source of pollutants in the form of pellets, the raw material or feedstock used by the manufacturers of plastic products. these tiny pellets enter the ocean via rivers and outfalls of plants that manufacture them or from trucks, trains, and ships during loading, transport, or unloading.

Contributors to plastic pollution also include people who never go to sea or visit beaches. Plastics are paart of the solid waste generated on land and dumped aat sea and part of the trash being trasported to the ocean by rivers and municipal drainage systems.

Because plastics in the oceans is a global problems, solving it will ultimately require the efforts of all countries, including perhaps international regulations. But international regulations governing the disposal of plastics are not yet in place and, even if they were, there remains the question of how effectively they could be enforced.

In the meantime, here are some suggested ways to help combat the problem of plastic pollution.

- **Take the minimum amount of non-degradable products on board vessels and to beaches.**

- **Use bulk containers for drinks and other products to better control and manage their disposal.**

- **Make maximum use of disposal technology, including the compaction and incineration of waste aboard vessels large enough the accommodate such facilities.**

- **Retain net fragments, fish line, bait bags, plastic convenience products, and other kinds of potentially harmful debris for disposal ashore, preferably at recycling stations. For ports without such facilities, encourage authorities to provid them.**

- **If possible, bring ashore for disposal any derelict fishing gear encountered at sea. If derelict gear must be returned t the sea, dispose of it in a responsible manner by rendering it incapable of catching or entrapping marine life or birds.**

- **Encourage anti-litter efforts, including the placement and use of trash cans on beaches and at marinas.**

- **Support and participate in volunteer litter clean ups of beaches.**

Alonzo T. Pruter is a fishery biologist and partner with Natural Resources Consultants, 4055 21st Avenue West, Seattle, Washington 98199. This article was reprinted from Fisheries, Vol. 12, No. 1.

Teaching Resources

The large poster, "Our Ocean. It's Drowning," and small post cards of the poster along with a slide show and narrative introducing the issue of marine debris is available for loan from Natural Resources Consultants. The posters and cards are free and there is no fee for borrowing the slide show. Make requests in writing to: Natural Resources Consultants, 4055 21st. Ave. W., Seattle, WA 98199.

"Ocean Plastic Pollution," a slide show designed for middle school students, is in production at the Hatfield Marine Science Center. It will be available for loan after January 1, 1988. Make your request in writing to Vicki Osis, Hatfield Marine Science Center, Newport, OR 97365.

Plastics in the Ocean: More Than a Litter Problem, a publication from the Center for Environmental Education, 1725 DeSales St. N.W., Suite 500, Washington D.C. 20036 - (202) 429-5609. It is available for purchase for $8.95.

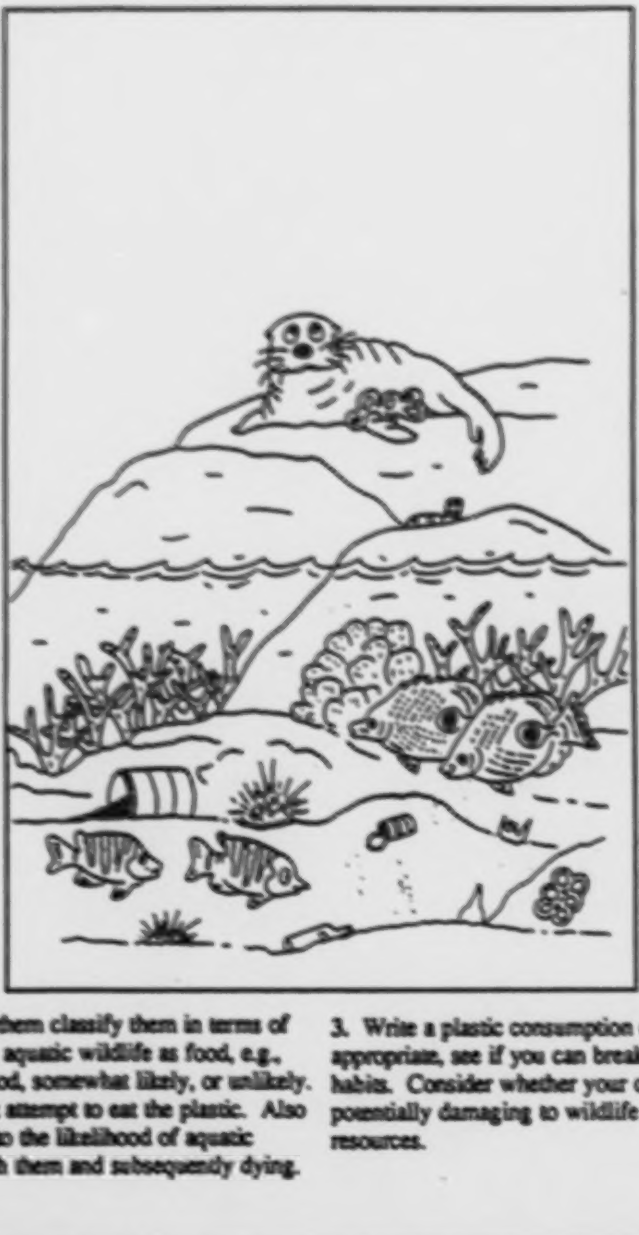
The Entanglement Network Newsletter, is a cooperative effort to facilitate the exchange of information on the problems of marine debris, entanglement, and incidental take. Organizations participating in the newsletter include the California Marine Mammals Center, Defenders of Wildlife, Greenpeace, the National Audubon Society, and the World Wildlife Fund, to name just a few. It is produced by the Center for Environmental Education, 1725 DeSales Street, N.W., Washington, D.C. 20036.

NOTE: The program for the November 6, 1987 NAME meeting scheduled at the Marine Science Center in Poulsbo will focus on the issue of plastic debris. Put it on your calendar and join us to gain some new information and teaching ideas.

Activity: Plastic Jellyfish

from Project WILD Aquatic Education Supplement copyright 1986 Western Regional Environmental Education Council

Objectives: Students will be able to: 1) evaluate the potential effects of plastic waste on aquatic wildlife; and 2) identify specific actions they can take to help remedy the problem.



Method: Students monitor the plastic waste production in their own households, research its effect on marine life, and propose various ways to lessen the problem.

Background: See the article "Plastics in the Marine Environment" on page 20 of this issue of CLEARING.

Materials: Plastic waste from home

Procedure: 1. Ask the students to collect and save every piece of plastic waste produced in their homes for a two-day period. Have them bring these materials to school. Caution the students to clean the plastics before bringing them to school so that they are free of food or drink remains. Also caution them about toxins such as ammonia, chloring bleach, etc., which may be in the containers. These should be emptied and rinsed completely.

2. Ask the students to separate these plastic waste materials into categories. Have them classify them in terms of how they might be perceived by aquatic wildlife as food, e.g., very likely to be perceived as food, somewhat likely, or unlikely. Identify the species which might attempt to eat the plastic. Also classify the materials according to the likelihood of aquatic animals becoming entangled with them and subsequently dying.

3. Ask the students to hypothesize about how these materials might affect aquatic animals. Have them check their hypotheses against current findings reported in the literature, or provide them with sufficient information to do so. Ask the students to summarize what they have learned about the potential hazards to aquatic wildlife from plastic waste materials.

4. Invite the students to survey their community for plastic litter. Look to see if and where it exists. Investigate its potential negative impact on animals in the community. If there is damaging plastic litter in the community, ask the students to create an action plan to help take care of it.

Extensions

1. Contact local environmental, conservation, animal welfare, and wildlife groups to see what is being done about the impact of litter on local wildlife and if specific help is needed.

2. Establish a litter patrol. Designate specific targets such as nearby beaches, lakes, and stream beds. Establish scheduled tours of these areas to pick up plastic and other forms of litter.

3. Write a plastic consumption conservation plan! If it seems appropriate, see if you can break some of your own plastic habits. Consider whether your own uses of plastics could be potentially damaging to wildlife as well as wasteful of natural resources.

Activity: Putting Your Product in a Package

Rationale: Packaging is the largest single component of household solid waste. Many materials produced for the market place, however, need to be packaged in order to protect them during shipping. At the retail outlet, packaging serves to advertise products, identify contents, and may be required to meet regulatory standards.

Subject: Consumer Education, Business, Economics, Design, Industrial Arts.

Grades: 7-12

Learning Outcome: Students will understand some of the benefits and drawbacks of packaging. By examining packaged products students will understand the function packaging plays in protecting and marketing products. Students' design of packages will reflect their awareness of the waste reduction and resource conservation consequences of packaging decisions.

Materials: A collection of packaged products brought to school by students. List of functions/benefits and drawbacks of packaging (see inset). Materials for design/construction of prototype packages (cardboard, paper, colored pens, etc.)

Learning Procedure: 1. Teacher or students bring to class products gathered from the home that represent a variety of packaging styles.

2. Divide students into groups. to a group, distribute all products in one category (eg., cosmetics, food, household products, etc.).

3. Ask students to select a product that they would like to design a new package for.

4. Discuss with students the functions/benefits and drawbacks list.

5. Ask students to list the function and design considerations they feel are important in designing the packaging of the products they are examining. Ask: Why did the producer package his product this way? How else might this product have been packaged?

6. Ask students to identify the packages which could be reused or recycled.
Ask: How can we reuse or recycle the packaging materials after we have used the products?
Ask: What will happen to the packaging we cannot reuse or recycle?
Ask: How can we as consumers reduce the 4.6 pounds of waste we, as individuals, produce every day?

7. Have students develop design specifications for the packaging they will create. challenge students by explaining their designs must include considerations of waste reduction, reuse, and recycling, as well as public safety, product protection, shipping weight, cost of packaging material, advertising, and public demand.

8. Ask students to identify the product they wish to design a new package for.

9. Share with students the materials you have provided for designing and making prototype packaging for their products.

10. Ask students to present drawings/prototypes to the class and explain the reasoning for their design.

Functions/Benefits of Packaging

-preservation and protection of contents
-sanitation and safety
-identification of product
-prevention of theft
-provides instruction as to content and use of product
-compliance with regulatory standards
-provide employment
-increased profits

Drawbacks of Packaging

-packaging contributes heavily to our growing problem of solid waste
-if not reused or recycled, the energy and natural resources that go into packaging are lost forever in landfills
-packaging may create false impressions of the quality and amount of the product contained within
-increased cost to the consumer

Used with permission from A-Way With Waste; Second Edition, Washington State Department of Ecology.

Chart used with permission from A-Way With Waste; Second Edition; Washington State Department of Ecology with information from the Book of Lists 2.

Activity: Where Is "Away?"

Rationale: The garbage or trash that is found on our beaches will decompose naturally in time and many people will dump their materials with this rationale. But the amount of time this takes and the volume of trash is turning many beaches into an eyesore and creating an environmental hazard.

Subject: Science, Social Studies

Grades: 4-12

Learning Outcome: Students will recognize the quantity of trash that accumulates on the shoreline, and the time it takes that trash to decompose.

Materials: Scale (fishing type that weighs hanging items), collecting bags (Plastic? not a good example, better to use paper, reusable cloth or burlap), marking stakes, "Enduring Litter" chart from Away With Waste curriculum (note on chart: the plastic 6-pack cover is NOT the 6-pack plastic retaining rings, the one pictured is rigid plastic).

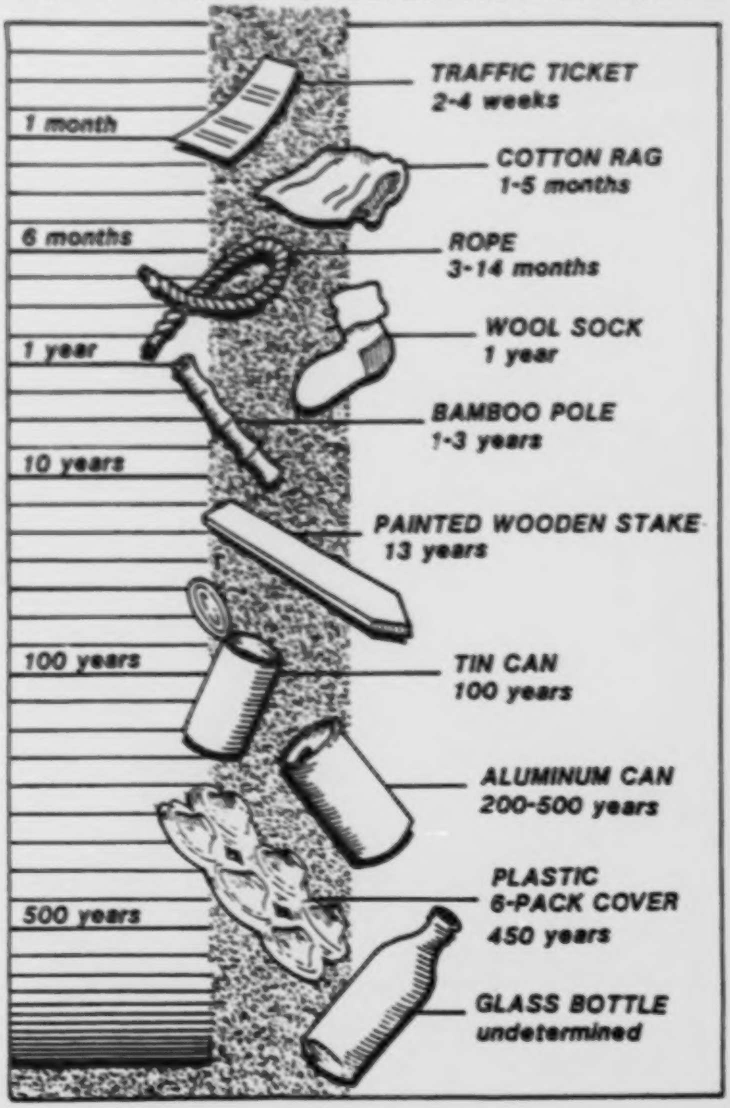
Activities: 1. Divide the group into teams to collect different materials, one for plastics, one for paper, one for wood, etc. Give each group a collecting bag.

2. Choose a stretch of beach or streambank on which to collect. You may want to use a measured distance so that students can compute the amount of trash per mile.

3. Have each team walk along the beach and collect the material they were assigned to find.

Enduring Litter

Litter at the roadside is ugly. How long it will stay before decaying may be an ugly surprise.



4. Back in the classroom, have the students weigh the different types of trash and compute the approximate amount in one mile of beach. Have the students estimate how long each material will take to decompose over time. You may need to discuss what decomposition is and how the process takes place.

5. Time Capsule - If you have a place in the school yard, or in a generous local parent or teacher's yard, bury each material in a marked spot for retrieval at a given time (perhaps do this at the beginning of the school year, and dig up near the end of the year). The decomposition times can then be compared to the students' predictions. For the remaining materials that have not decomposed, have students construct a time line showing total decomposition of the materials.

Created by Holly Anne Foley, Marine Science Center, Poulsbo, Washington.

Whole-Body Environmental Education

Michael G. Weilbacher
The Academy of Natural Sciences
Philadelphia, PA

For years, the techniques of theater and dramatics have been underutilized and ill-employed by educators of most disciplines. Lack of awareness, lack of training, a perception that theater and dramatics are mere frills, and back-to-basics cost-cutting have long threatened the implementation of drama in education. But lately, educators are beginning to realize that theater, and all the arts, can be tapped as mechanisms for teaching a breadth of information, including science and environmental concepts.

In television production, there is a studio direction called the "talking head." When the director calls for one, the camera zooms in on the actor's head and shoulders; Dan Rather is usually broadcast as a "talking head." In many educational settings, formal or non-formal, educators often operate as "talking heads" - the head of the educator dispenses information to the heads of the students. the intent of whole-body education is to break through the "talking head syndrome"; that is, the whole body of the teacher is an instrument that can teach information to the whole body of the learner. The techniques and processes of theater and creative dramatics are not only fertile places to plant educational seeds, but these fields are ripe for the picking by environmental educators.

Students can, for example, learn how the water cycle works through a variety of formats: textbooks, lectures, films, lab demonstrations. But learners can also become the water cycle, pantomiming the cycle's movements of evaporation, condensation, and precipitation. By moving as the cycle, some students more vividly understand how it works. Supplementing other techniques, this dramatic style of learning can be powerful reinforcement.

Research continues to reveal the intricate processes by which learning occurs. Students not only employ a variety of learning styles, but they display style preferences. One style is kinesthetic learning - these students need to move to learn, and suffer greatly in "talking head" situations. Whole-body environmental education fulfills the needs of kinesthetic learners while providing a change of pace for learners of other styles. It must also be remembered that kinesthetic learning is a valid learning style, not a learning disability, and a style that clearly needs addressing.

Whole-body EE is therefore dedicated to the concept of "the whole child - that (the) body, including (the) senses as well as physical movements, is as important as (the) mind" (Weitz, 1972). Whole-body EE borrows heavily from the fields of creative dramatics and children's theater. Creative dramatics explores the use of theatrical techniques in an informal atmosphere with no intention of performing for an audience. Children's theater has as a goal a live performance. Creative dramatics incorporates movement, dance, creative play, improvisation, pantomime, story dramatization, and more in meeting its objectives.

The following activities are meant to be used and adapted in a variety of settings. Some are good introductory activities, others are great wrap-ups. Special attention has been paid to the pacing of the material to help participants warm up to the process. Notice that "low-threat" activities are done early and lead the participants into higher-threat, more demanding material. The best activities to begin with are open-ended large-group activities, ones where a variety of responses are equally appropriate. Incidentally, when paced properly by a trained and inspired leader, creative dramatics exercises can easily lead into performance theater, a process discussed later.

Activities

1. Narrative Pantomime: "Metamorphosis." Narrative pantomime is a long-used technique of early childhood educators. It is also referred to ass "guided movement" and "story movement." The leader simply tells a story, and the learners, guided by the leader, move to the story; they become the story.

In "Metamorphosis," the group begins curled up as eggs, and the leader relates the story of the hatching of eggs into caterpillars, then into cocoons, then into butterflies. As the story unfolds, the participants create the appropriate movements.

Narrative pantomime works beautifully with many stories: tadpoles/frogs; seeds/trees; seasonal changes, and more.

2. Theater Game: "Noah's Ark." Joseph Cornell's *Sharing Nature With Children* (1979) includes this very effective game. The names of animals (duck, frog, turtle, etc.) are written on index cards in pairs. Each participant

chooses a card. When the leader says "Go!" the players become, through sound and movement, that animal - and searches for the other person in the group who is the "mate."

3. Theater Game: "Herds." In this game, a circle of players are assigned to be one of three animals: cows, pigs, or ducks. At the signal, each player - close-eyed! - makes that animal's sound, and tries to find everyone else in the circle who is the same animal. In the end, three herds of animals celebrate their successful search with loud moos, oinks, and quacks.

For young children, the game is still fun played open-eyed. The game can be adapted to teach various methods of animal communication.

4. Theater Game: "Group Animals." Participants form groups of 4-5, and each group chooses a living creature, plant or animal, that it wishes to "perform." Each group member becomes one element of the creature (wings or tail or antenna) and the group then creates, "live on stage," that creature. Additionally, the group is charged with giving their creation movement. The groups then perform their group animals in turn, guessing what each other has made.

5. Creative Movement Exercise: "Food Chain Ballet." The players form two widely-spaced lines facing each other, crouching low. One player rises as the sun, and "shines" on one line. That line grows into waving grasses and the sun joins them as a grass. The second group becomes grasshoppers, and moves through the grass, "eating" each blade in turn. As grasses are eaten, they drop into a crouch, and the grasshoppers pass through, stop, and turn around. The grasses then become frogs that eat the grasshoppers. The grasshoppers transform into snakes that eat frogs; frogs turn into hawks, swoop onto the snakes and devour them. Thereupon, everyone dies, and decays into soil; the sun rises again, and the grasses grow.

The leader beings by talking through the activity, rehearses it through, and then it's performed, with music, as the "food chain ballet."

6. Creative Movement Exercise: Concept Pantomime. Players are divided into groups of four and choose a card, upon which is written one of the concepts often taught in EE settings: "photosynthesis," "seasons," "water cycle," "endangered species," and others. The groups create simple pantomimes to teach the other participants that concept. Again, the others attempt to guess what concept the group performed.

Dramatics Into Theater

After leading a group of players through a series of activities such as these, it is easy to see how the activities can evolve into performance theater.

Creative movement pieces like the "food chain ballet," when added to other movement pieces on air, water, and soil cycles, or forest, pond, or ocean communities, even recycling and resource conservation, can be placed together in a sequence that is performed by the group but narrated by the leader. Using movement with taped music, with little need for memorizing dialogue, creates a special brand of performance theater that is economical, effective, and empowering for the performers.

When your students teach their peers what they have learned through theater assembly programs - that's effective EE, education that satisfies the needs of kinesthetic learners, and exemplifies the best of whole-body education.

Conclusion

The importance of kinesthetics is becoming better understood as the research unfolds. Expressive arts therapists know that our body stores knowledge in "muscle memory." Pressure exerted on certain muscles may trigger emotions or deeply buried memories.

This is not, in fact, new information. Dramatist Claude Wise wrote in 1923 that "whenever it is possible, (teachers should) tie up the verbal memory process with motor memory process, (for) it is surely economy to do so." Chenfield (1980) continues: "For some people, it is the only way they can really learn... Children who rarely succeed will find many opportunities for building a healthy self-image and strengthening self-confidence if movement is correlated with all areas of the curriculum.

Thus, whenever an environmental educator leads a group of learners, kinesthetically-oriented activities must be blended in with other activities to teach to the full spectrum of learning syles. the activities presented herein are a beginning, and work in the entire range of

EE settings - classrooms, outdoor walks, campfires, even as introductions to more formal events like slide-talk shows and evening banquets. The author has had great success in all these settings, and whole-heartedly, whole-mindedly, and whole-bodily recommends that environmental educators enrich their curricula and programs with many "moving moments."

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Keynote Address to the 1986 Conference of the North American Association for Environmental Education held in Eugene, Oregon.

The Challenge for Environmental Education In An Information Age

Jerry Berberet, President
North American Association for Environmental Education
Dean, College of Liberal Arts, Willamette University
Salem, Oregon

Our world has entered a period of accelerated cultural change in response to the impacts of electronic information technologies. Such change not only affects the ways we work and play, but the ways we relate to one antoerh, the ways we construct our views of reality, and the structures of the cinstitutions by which we manage our society.

Almost all of us in the industrialized world have, often unwittingly, experienced these changes, although the public tends most to associate society's transition to an information age with the technology itself — with computers, robots, satellite dishes, and monitoring gadgetry in new cars. Most of us accept, often with enthusiasm, that we must use computers in our work and personal lives; likewise, we recognize that international diplomacy was changed forever via telecommunications during the 1980 hostage crisis in Iran. We realize that a great deal of this technology is a byproduct of the space program. Many of us are at least vaguely anxious that computers and robots may cause widespread technological unemployment. Some of us even worry that our children may prefer interaction with their home computers to human relationships. Yet, how much have we though about the effects of the information age upon relationships between people and the environment?

In the environmental field new information technologies are perhaps most conspicuous in the areas of environmental monitoring and assessment. Space satellites, for example, have made possible remarkably sensitive monitoring of global events and precise mapping of natural and built environments. Electronic assessment techniques have produced convincing evidence of source points of acid precipitation, extended our knowledge of the Antarctic in dramatic ways, and made possible the spectacular discovery and filming of the Titanic. In August, 1986, Newsweek magazine reported the role of electronic technologies in the finding that as many as 8 million homes may be threatened by radon gas radioactivity, a potent cause of lung cancer.

Unquestionably, our ability to pinpoint responsibility for

EE in an Information Age
(continued from page 3)

> **Development pressures, exacerbated by rapid population growth, not only threaten to overwhelm the natural environment through deforestation, desertification, soil salinization, and waste generation, but to undermine the cultural stability necessary to create and maintain the social and political infrastructure which is basic to a society's successful development.**

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environmental degradation and, correspondingly, a potential to develop more effective management and regulatory procedures on a biosheric scale is being enhanced enormously. In spite of this increased capacity to know, however, the environmental impacts of human activity with the analytical context of a post-industrial era have received little attention to date. Environmental impacts of post-industrial human activities are the primary focus of this paper, with an emphasis on implications of the information age for the world view and subject content of environmental educators.

I agree with John Disinger's contention that environmental education today largely reflects the focus and concerns of its predecessors of the 1960s and before, a preoccupation with nature study, conservation education and outdoor education. While commending the continuing educational value of these three forms of environmental education, Disinger expressed concern that environmental educators inadequately treat relationships between the environment and human society, including recent advances in scientific knowledge of environmental problems and their complexity and the development of alternatives for problem resolution. If this lack of attention to the human ecosystem and institutions for environmental management has been a shortcoming of environmental education in an industrial era, the effects of such inattention may be more serious as global society enters the information age.

Paul Hawken addresses this notion of society's transition: "The informative economy will not replace the mass (industrial) economy; it will absorb and include the mass economy in the course of its evolution. We will need steel, rubber, airplanes, pulp mills, and trucks for centuries." the great industrial era in the developed world was built on cheap and plentiful fossil fuel energy, primarily oil. this era came to an end in 1973 with the Arab oil embargo and the ten-fold increase in the price of oil which soon followed. The developed world had little choice but to accelerate technological innovations in an effort to use less energy per unit of production. This occurred primarily in the form of rapid developments in computers, robotics, and biotechnology and the application of energy conservation measures. The economic shift took place so quickly that by the late 1970s energy demand curves began to flatten. This, in turn, produced a leveling, then a fall in world oil prices. Soon oil producing countries, almost all from the developing world, experienced debt crises as declining oil revenues failed to provide sufficient capital to service large loans extended primarily be Western banks during boom times to finance development.

Presently, a somewhat oversimplified global reality includes a developed world at various tages in the evolution of information and service economies and a developing world with high economic aspirations that is forced to plalce increasing economic pressures on the environment to generate revenues for debt payments. Development pressures, exacerbated by rapid population growth, not only threaten to overwhelm the natural environment through deforestation, desertification, soil salinization, and waste generation, but to undermine the cultural stability necessary to create and maintain the social and political infrastructure which is basic to a society's successful development.

Hawken is convinced that the information era is here to stay. Our choice, he contends, is either to "consume more energy and drive its price higher, making goods more expensive and causing inflation and declining wages; or [to make] the economy more informative by developing methods of production and patterns of consumption that use less energy and capital resources and more knowledge... The industrial age mechanized manual labor; now semiconductors and microprocessors are bringing technology to the mind." Information technologies build sophisticated analysis, communication and decisionmaking capabilities into the technology itself.

Fascinating! Technology and the marketplace conspire to develop a more conserving society which at once uses less energy and fewer resources and, due to its increasing efficiency, generates less waste because the speed and minaturization of electronic technologies make possible a harnessing of power and productivity unheard of in the industrial era. In one sense the implications are simultaneously mind boggling and optimistic; in other ways the possibilities seem contradictory and depressing. Either way important indications about the future are presented that deserve the attention of environmental educators.

On the optimistic side a technolgocial revolution which implies lower energy and resource consumption, while reducing the volume of waste by-products, has to be welcome news for an environmentally-stressed planet Earth. Likewise, the analytical, communicative, and productive capabilities of the new technologies would seem to have substantial potential for educational, social, economic, political and cultural development. Never has the technological tool chest contained mrore tools to benefit humankind. Although it is true that production of computer chips releases some toxic wastes to the environment

We environmental educators have a long way to go before we will be taken as seriously aswe should in the very serious debate about how to determine society's environmental future during the information age.

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and has some negative effects on worker health, such problems seem to be manageable. Much more toxic are the mountains of petrochemical wastes generated by the plastic throwaway society that originated in the industrial era.

On the pessimistic side, the information age, at least in the short term, has some foeboding implications, especially for the developing world. With the exception of the somewhat uncertain ability and will of the more developed world to clean up toxic wastes and manage nuclear energy safely, arguably the most alarming environmental cises of our time are occurring in the developing world, e.g., worldwide disappearance of tropical forests, famine in Africa, widespread destruction of soils — crises being exacerbated by population growth and increasing debt pressures.

In the global economy of the information age, developing world economies may be seriously disadvantaged in competing with the electronic technologies of the developed world, electronic technologies that are more efficient in the production process. One might argue that the developing world has a competitive advantage in its large cheap labor force. But, unless this often uneducated labor force can quickly learn information age skills, it may not be a decisive factor due to the rapidity of technological change. The same kinds of competitive forces that currently most benefit Japan and the United States are also straining the adaptive capabilities of Eastern and Western Europe. At least in the short term the information age seems to be exacerbating development pressures upon the environments of the developing world.

Yet, several factors could mitigate this bleak outlook for the future of the developing world. First, although E.F. Schumacher worte from a late industrial era perspective, his advocacy of appropriate technology still seems relevant today. Gaining technological efficiency in ways that maximize inputs of human labor and scarce development capital while minimizing adverse environmental impacts is an information age necessity. Second, to compete successfully in global markets third world development must minimize the energy and resource inefficiencies and environmental excesses of industrial era practices, while maintaining sufficient cultural stability to avoid political and social disintegration. The latter is a sorry tale of woe that has plaagued the developing world since former European colonies became independent states after World War II.

Environmental educators have paid little attention to the importance of continuity when a traditional culture modernizes, but the values, mores and institutions of a traditional society can represent valuable sources of stability in the wake of modernization presures. If the pace of economic development is too rapid and focused exclusively on the goal of improving material standards of living at the expense of nonmaterial dimensions of quality of life, a void may be created jeopardizing the social cohesion provided by the traditional culture. Economic development may seem a hollow achievement, indeed, if such a void is filled by social disorder, authoritarian politics and cultural anomie.

Development is a complex cultural phenomenon. Many of the values, customs and institutions of traditional cultures are necessary building blocks for the ingrastructure required to support and manage an evoloving society. In making the transition from traditional to modern status, most nations probably cannot simply leapfrog the industrial era and enter the information age. And, given the varianes among the national cultures, for developing nations to follow mindlessly the development paths of industrial societies, especially those of highly developed nations whose cultural traditions may be quite different from their own, would seem to be folly. The environmental educator who focuses singlemindedly on physical and biological conditions and ignores sociocultural differences, the workings of a global economy, and the rudiments of current interaction among energy, resources, waste, technology and environment may contribute to such folly.

Technological innovations of the information age are probably imperative in the economic development and environmental amelioration of the developing world. Whether the introduction of new, disease-resistant plants, the reforestation of eroded slopes, the restoration of salinized soils, the development of culturally-compatible birth control methods, the mass communication of culturally-compatible development education, or the harnessing of information age technological efficiencies—it would seem that a wise scenario for the future acknowledges information age realities and makes application on a scale appropriate to unique cultures and environmental conditions.

What are the implications of all this for the environmental educator? First, there must be an emphasis on content as well as pedagogy in environmental education. An environmental educator who does not also engage in ongoing inquiry and analysis about global cultural and environmental interactions may be a loose cannon on the deck whose actions impede

An environmental educator who does not also engage in ongoing inquiry and analysis about global cultural and environmental interactions may be a loose cannon on the deck whose actions impede society's understanding of human-environment relationships and what must be done to insure a sustainable future.

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society's understanding of human-environment relationships and what must be done to insure a sustainable future.

Regarding content, the world view in environmental education was shaped by the highly politicized environmental movement of the 1960s and currently seems locked in a time warp. It is unfair oversimplification to say that environmental educators only stress negative, anti-economic stances that portray the pastoral serenity of Constable painting or the pristine wilderness of Muir's Yosemite as humankind's ideal relationship with nature. But, we environmental educators have a long way to go before we will be taken as seriously as we should in the very serious debate about how to determine society's future during the information age.

Having delivered what I earnestly intended as loving criticism among colleagues, I hasten to stress that EE's stress on awareness of nature is critical to the positive value formation which undergirds environmental stewardship at a time when electronic technologies often oversimplify and depersonalize contact with nature. As well, the EE program emphasis upon nature and development of simple ecological concepts is primarily directed toward children. The most serious shortcomings of EE may well lay at the secondary and college levels where habits of integrative thinking have been inadequately infused into the humanities, science and social science disciplines. EE must acquire facts as well as philosophy, a weighing of well-crafted alternatives as well as simplistic conclusions and calls to action.

A few ruminations to conclude these remarks:

1. "Think Globally — Act Locally" is more than a superficial slogan and its implications run deeper than a simple ecological view of the biosphere and membership in the local environmental movement. Environmental educators must develop a more international and intercultural world view, while recognizing the uniqueness of localities as laboratories for study and stewardship.

2. EE must relate more effectively to people of diverse cultures — inside as well as outside North America — and relate issues to hunger, social justice, and civil rights as well as to environmental quality. We environmental educators must reach a wider ethnic and economic audience if our message is to be effective. A legitimate fear about the information age is that it will increase the wealth and knowledge gap between rich and poor. Individuals and school districts that can afford computers and other electronic technologies will have them and those that can't won't, to the detriment of the latter in an age of rapid technological and social change.

3. A fundamental re-examination of preservice and inservice teacher education programs is going on in North America. The Holmes Group study calls for fundamental changes in the preparation of teachers, but we in environmental education have been silent on this important topic to date. Implementation of what is worthy in this paper depends upon the best poosible preparation of all teachers to deal with the content of environmental education. If we let the current opportunity slip by without action, our next chance to influence teacher education may not come along for another decade or more.

4. Using effective educational processes and technologies is always challenging, but let's harness the new technologies for EE. Many of the greatest information age advances have come in our capacity to understand more fully human-environment relationships.

Finally, the current pace of change is so rapid and the nature of environmental problems so serious that we simply must devote our attention to the future. What must we do as environmental educators to assure a sustainable future? Can we describe environmental problems comprehensively, incorporating cultural analyses as part of our profile of the global system? In what ways might differing ethical perspectives by treated as central to the EE message? Could we infuse concepts like "interdependence" and "adaptability" with greater intellectual substance to support their simple ideological appeal? How do we communicate effectively across political, economic, social, cultural, and geographical lines?

The challenge for the future encompasses the entire biosphere. Few causes would seem to have more long term importance. There is a special kind of commitment to human betterment and a better world that inspires environmental educators, and this is one of our best hopes for the future.

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Acid Precipitation in the Pacific Northwest

by John Baldwin and David Kozak
University of Oregon

Sensitivity of Ecosystems in the Pacific Northwest

Over the past decade acid rain has received much media exposure. However, the term has seldom been used to describe atmospheric conditions in the Pacific Northwest. Although the Northwest has not, to date, experienced significant environmental damage from acid precipitation as has eastern North America, some scientists believe that the Northwest should be concerned about the vulnerability of some of its sensitive ecosystems to acidification. In fact, in Scandinavia and eastern North America, damage to ecological systems and human artifacts has occurred in regions with the acidity of precipitation near the lower end of the range of that found in some western ecosystems.

The geological features of high elevation and low buffering capacity (crystalline rock) of the ecosystems of the Pacific Northwest make them particularly sensitive to acid precipitation. In the upper elevations of the Northwest, snow accumulates high concentrations of sulfur and nitrodgen oxides which create a surge of acid during the spring snow melt in aquatic ecosystems. The short growing season at high altitudes impedes the ecosystem's recovery from this stress. The thinner soils, steep slopes, and granitic bedrock in the Cascade mountains have a very low neutralizing capacity to acid influents. For example, of the 29 lakes sampled in the Washington Cascades, alkalinity ranged from 4 to 190 ueq/L with a median of 57 ueq/L. The U.S. Environmental Protection Agency classifies as acid sensitive lake as one with alkalinity below 200 ueq/L.

Ecosystems are in jeopardy where sensitive resource areas and acidic deposition overlap. At risk are the important forest, agriculture and aquatic resources of the Pacific Northwest which are the foundations of the Northwest's economy. Thus, we should be very cautious in protecting these ecosystems from acid damage.

Sources of Acid Deposition

The main precursors of acidic precipitation are sulfur and nitrous oxides which are discharged by power plants, industrial processes and motor vehicles. When these compounds react with water ans sunlight in the atmosphere, they form acids such as sulfuric and nitric acids.

The major non-point sources of these emissions in the northwest are from transportation and urbanization. For example, central and southern Puget Sound emissions from urban areas are estimated at 195,000 tons of SO_2 per year and 130,000 tones of NOx per year. Two major point sources of nitrous and sulfur oxides are the Centralia Power Plant in Centralia, Washington (which has been discharging 59,000 tons of SO_2 per year

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Acid Precipitation in the Pacific Northwest

and 37,000 tons of NO_x per year) and Mt. St. Helens (which discharges 112,000 tons of SO_2 yearly).

Transport

Storms in the Puget Sound begin with low level winds pushing the polluted air mass from the urban and industrial areas to the north. Significant deposition occurs on the coastal plain of the basin and lower slopes of the surrounding mountains. Deposition could be fairly widespread over the basin. However, because of the high frequency of precipitation events in the Pacific Northwest, most of the pollutants are washed out of the atmosphere immediately downwind from the source regions. A surge of acid is often measured at the onset of a precipitation event. This is thought to be due to the build-up of acid precursors during the preceding dry period. This initial surge is often followed by lighter rainfall lasting a long period of time but at much lower levels of acid concentrations. This lingering low level deposition may occur at a considerable distance from the source areas with a gradient of progressively lower levels of acid in the Puget Sound and Vancouver lowlands and the lower slopes of the Cascade mountains. The distribution of local versus distant sources of acid deposition also depends in part upon the local rate of conversion of oxides to acids in addition to atmospheric currents and topography. In the summer months when precipitation is less frequent, transport of acid precursors away from major source areas is more likely to occur.

Deposition

Wet sulfur deposition throughout most of the Pacific Northwest is much lower than the 20 kg/ha/year target level established as the threshold for ecological damage in eastern North America and there is currently no conclusive evidence of significant environmental damage in the region. However, it is apparent that some areas of the Northwest are currently receiving significant sulfur loading.

Areas of particular concern include southwestern British Columbia and the Puget Sound region. In southwestern British Columbia and in the mountain slopes north of Vancouver, sulfate deposition has been measured above the 20 kg/ha/year target. This wet sulfate deposition may be causing damage in the lakes and rivers of this region, yet no conclusive evidence of damage exists to date. Precipitation in the Puget Sound region has a pH range from 4.0 to 4.5 while to the east, the CAscades receive large quantities of precipitation ranging from pH 4.6 to 5.0. The acidity of natural unpolluted rainfall is generally considered to be in the range of pH 5.6.

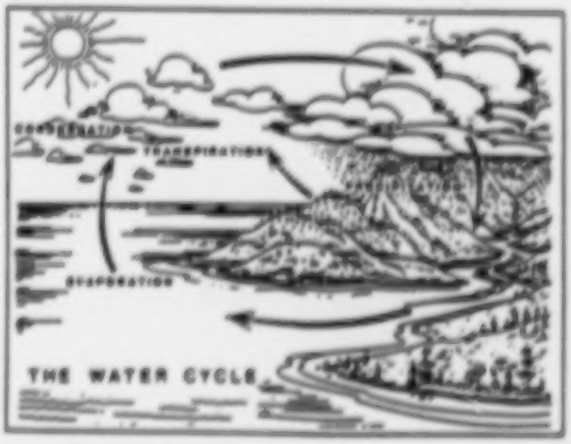
Ecological Impacts

Several scientific studies have provided strong evidence which suggests that aquatic ecosystems, terrestrial ecosystems and human health are adversely affected by acid deposition. For example, salmon stocks in British Columbia's coastal mountain range could be in jeopardy if acidic deposition continues in this region. Laboratory data indicate that a pH of 5.0 or less of surface waters could cause increases in the mortality rates in the early development stages of Pacific Salmon.

In general, damage to aquatic ecosystems from increased acidity is characterized by decreases in species diversity and productivity. Field studies also indicate that low pH waters are toxic to phytoplankton, zooplankton, and expecially fish and amphibians.

Acid precipitation is also known to decrease the levels of essential calcium and magnesium nturient cations from the soil, and change the cycling and availability of other nutrients. Acid precipitation has also been implicated in the mobilization of toxic metals and the alternation of microbial activities. This can reduce overall system decomposition and produce and health and ecological hazard to living forms from toxic metals.

No conclusive evidence currently exists suggesting there are significant environmental impacts from acid precipitation in the Northwest. However, due to the extreme sensitivity of Cascade streams, lakes, and soils to acidification, a conservative management approach and further research are definitely warranted.



Acid Rain Activity

Deadly Skies

(from the Project WILD Aquatic Supplement)
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Grade Level: 1-12 **Subjects:** Science, Social Studies

Duration: Two 20-45 minute periods, plus growing time of one or two weeks for seedlings to show effects of acid precipitation.

Group Size: Any **Setting:** Indoors

Objectives: (for younger students) Students will be able to: 1) describe acid rain; and 2) describe the effects of acid rain on plant life. (for older students) Students will be able to: 1) describe acid precipitation; 2) generate and test hypotheses concerning effects of acid precipitation; and 3) make inferences about the potential effects of acid precipitation on aquatic life. NOTE: Acid rain is only one form of acid precipitation. The term acid rain may be used, particularly with younger students; however, older students should recognize that acid precipitation takes many forms.

Method: Through simulations and direct measurement, the students experience differing conditions of acidity in aquatic habitats and explore the consequences of acidic conditions on aquatic life.

Materials: One cup vinegar; two spray bottles; litmus paper for testing acidity; two trays of bean seedlings grown in the classroom (or bean sprouts purchased at a grocery store).

Procedure: 1. Begin by pouring a quantity of vinegar onto four or fie sheets of paper towel. Place these around the classroom when students are absent. When the students return, note their discomfort with a bit of theatrical drama. Is something wrong? What could be wrong? Solicit their descriptions of what seems to be wrong.

2. Collect the vinegar sources and discard them in a plastic bag that you can tie off tightly. Have the students understand that you wanted them to experience the discomfort of a kind of "pollution" in their environment. Point out to them that some creatures in the world cannot get rid of such discomfort as easily as you could in the classroom. Introduce the vision of a fish trapped in a mountain lake where the acidic environment is increasing day by day. The acid in the mountain lake is likely the result of acid rain.

3. What is acid rain? Has anyone hear of it? Encourage the students to offer what they know or have heard about acid rain and its effects. Establish a working definition of acid rain.

4. Using litmus or hydrion paper, test a sample of vinegar for acidity. Vinegar is simply a household item that can serve to illustrate or simulate some of the characteristics of acid precipitation. Next, test a sample of tap water. Vinegar does not typically get into our rain and water supplies, but something with similar characteristics — sulfuric acid — does with increasing frequency.

5. Put regular tap water in one spray bottle. Put vinegar into the other spray bottle. Introduce the students to the two trays of healthy bean seedlings. If possible have the students plant the beans earlier in the school term. Use potting soil, if possible, as it is usually pH balanced. For purposes of this activity, one tray will be watered and sprayed with the tap water and the other with the "acid" water (vinegar). Spray each tray with the appropriate experimental liquid — either the regular tap water or the vinegar. Repeat this process each day for several days, also watering the plants as needed with the appropriate liquid. Have students formulate hypotheses for testing during this process.

6. Ask the students to keep an observation chart for each tray, describing the general condition of the plants each day. If you want to develop some additional science and math skills, have the students measure and graph the growth of the seedlings.

7. Once the differences in the condition of the trays of plants are obvious, take two plants — one from each tray — and compare the overall condition of each, including the root structures of each. Add tap water to samples of the soil from each container in order to test the pH of the soil with litmus paper. Determine which soil is most acidic. Discuss the students' hypotheses, including evidence and conclusions. Ask the students to summarize what they have learned about the effects of this simulated "acid precipitation" on plant growth and health. What inferences can be made, if any? Consider the impacts on both plant and animal life.

THE ENVIRONMENTAL EDUCATION CURRICULUM INVENTORY

by Ron Gardella
Northern Kentucky University
reprinted from the 1986 Conference Proceedings of the North American Association for Environmental

The Environmental Education Curriculum Inventory is a curriculum assessment instrument designed to determine how well curriculum materials reflect the accepted goals of environmental education.
The Environmental Education Curriculum Inventory is available in two forms. The form printed here is a brief, one page model designed for quick assessment. The other is a more detailed model and requires a bit moretime. Both forms were specifically designed to be used by practicing teachers and reflect the following objectives:

1. They are easy to use and require little time.
2. They do not require the user to have a sophisticated background in environmental education.
3. They do not require specific training to use.
4. They communicate the accepted goals of Environmental Education.
5. They quickly reveal how well curriculum materials address the accepted goals of environmental education.
6. They facilitate the current practice of combinging pieces of different existing environmental education curricula in order to meet individual teacher needs.
7. They may serve as a guide for new environmental education curriculum development.

SUGGESTIONS FOR USE:

1. Scan entire Inventory Form before using it. Note different parts, directions for scoring, and recordingscores.
2. Scan the table of contents and take representative samples of the curriculum materials you are evaluating rather than reviewing the entire document in detail.
3. Use this brief form for initial assessment of curriculum materials. Repeat the assessment with the more detailed form as necessary. The more detailed form can be obtained by writing to:

Dr. Ron Gardella, Science & Environmental Education
BEP 160, Department of Education
Northern Kentucky University
Highland Heights, KY 41076 Telephone: (606) 572-5237.

HOW WELL WOULD THE MATERIALS CAUSE STUDENT USERS TO:

I. **Know facts, concepts, principles of ecology such as:**

a. All living things, including man, affect each other (e.g., predator-prey, food chain, food web, compeition, population behavior and distribution.)

Not at All	Yes, but poorly	Yes, fairly well	Yes, very well
0	1	2	3

b. Living things affect their non-living surroundings, and are in turn affected by these changes (e.g., water, mineral, pollutant cycles, pollution, distruction of animal habitat, plant succession, etc.)

Not at All	Yes, but poorly	Yes, fairly well	Yes, very well
0	1	2	3

c. Non-living things determine the kind of environment and in turn the variety and number of plants and animals (e.g., types of environments - desert, forest, pond, etc., animal and plant adaptation.

Not at All	Yes, but poorly	Yes, fairly well	Yes, very well
0	1	2	3

II. Know about and investigate environmental problems

a. Know that people use the environmental differently and often cause problems because of their values and attitudes.

Not at all 0	Yes, but poorly 1	Yes, fairly well 2	Yes, very well 3

b. Explore case studies that identify environmental problems, causes, and resultant effects.

Not at all 0	Yes, but poorly 1	Yes, fairly well 2	Yes, very well 3

c. Allow students to explore environmental problems, identify costs, and suggest solutions.

Not at all 0	Yes, but poorly 1	Yes, fairly well 2	Yes, very well 3

III. Know about and practice environmental action

a. Define responsible environmental action, types, categories, and/or examples.

Not at all 0	Yes, but poorly 1	Yes, fairly well 2	Yes, very well 3

b. Describes/presents models of responsible environmental action with a variety of action case studies.

Not at all 0	Yes, but poorly 1	Yes, fairly well 2	Yes, very well 3

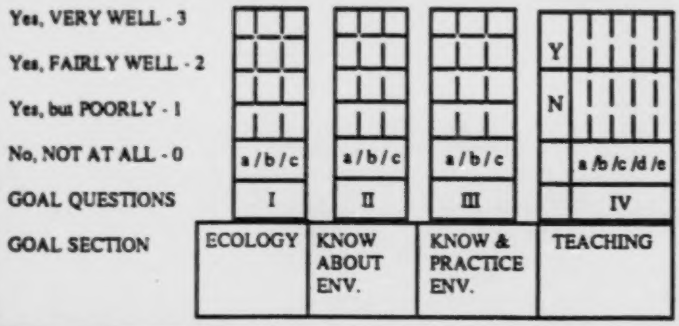
c. Allow students to suggest and/or take environmental action.

Not at all 0	Yes, but poorly 1	Yes, fairly well 2	Yes, very well 3

IV. Do the materials reflect recommended teaching methods and perspectives such as:

a. Using "hands-on" direct experience teaching methods.	Yes	No
b. Being on the appropriate educational level for student users.	Yes	No
c. Being current and accurate.	Yes	No
d. Adequately evaluating the stated lesson or program objectives	Yes	No
e. Having adequate directions and thus easy to use.	Yes	No

SUMMARY GRAPH (Shade each questions below as you did above)


Yes, VERY WELL - 3
Yes, FAIRLY WELL - 2
Yes, but POORLY - 1
No, NOT AT ALL - 0
GOAL QUESTIONS
GOAL SECTION
Y
N
a / b / c
a / b / c
a / b / c
a /b /c /d /e
I
II
III
IV
ECOLOGY
KNOW ABOUT ENV.
KNOW & PRACTICE ENV.
TEACHING

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Interacting With the Environment - Eddyville School

by Jeff Mitchell and Sarah Owen
Eddyville School

Sixth grade students at Eddyville School near Newport, Oregon tend hatchboxes as part of their coursework at the school. Photos courtesy of Jeff Mitchell.

Eddyville School is a K-12 public school located in the Coast Range of Oregon approximately 20 miles east of Newport. The school is surrounded by private timberland and pasturedfields, and overlooks the confluence of the Yaquina and Little Elk river systems. This rural setting, and the local population's reliance on their environment for their livelihood, makes the school an ideal setting for an integrated environmental education curriculum. **Jeff Mitchell**, who has had career experiences in forestry, beekeeping, tree surgery and agriculture, teaches Biology, Wildlife Biology, Forestry, Earth Science and Horticulture to students in grades 6-12.

The long term goals of the science program are to make students aware of the importance of their own interaction with the environment, to learn from the interrelationships in natural systems, and to apply this understanding to hands-on class projects. It is believed that only by directly *applying* the concepts learned from nature to the problems facing the human species in an activity-oriented curriculum will there be carry-over into real-life behavior. The program builds on the development of the student's degree of expertise; the more fundamental projects are taken on by middle school students and the most challenging and creative problems go to advanced biology students at the High School level.

The 6th grade science classes study the concept of "ecosystem." Each student creates self-contained living systems in the classroom and monitors the interrelationships, attempting to establish a stable community. By far the most exciting project is the rearing of 10,000 Coho Salmon and 10,000 Steelhead each year in the school hatchbox. This is done in conjunction with the Oregon Department of Fish and Wildlife and S.T.E.P. (Salmon and Trout Enhancement Program). The local fish biologist supplies eyed eggs each winter and students work in pairs daily to record temperature, count and remove dead eggs and fry and maintain the filtering system. Since the hatchbox is located in the woods, about 1/8th mile from the school building, students have a chance to develop their independence at getting the job done without being supervised. Upon return to class, they enter their data on the class data sheet and enter into the class activity.

The seventh grade science classes study the forest as an ecosystem. Students actually manage two stands on school property for timber production, wildlife enhancement and research by later generations of students. this year, one stand was commercially thinned and the harvest was used on two other environmental projects.

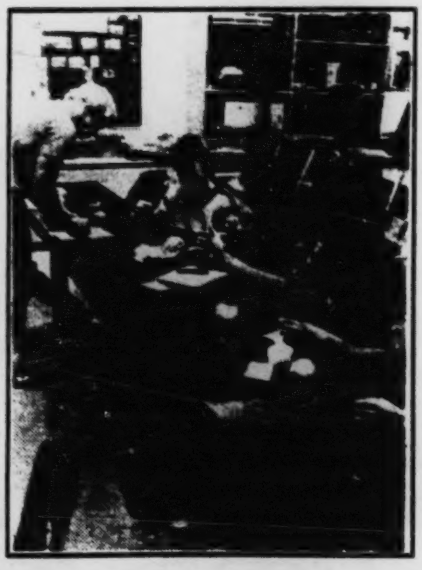
A local horse logger donated his time and team to show how horses can be used as an alternative to bulldozers and clearcuts. Using his team, student-cut-and-peeled-logs were skidded up to the hatchbox where students built a pole bridge with handsplit cedar decking to provide easier access to maintain the fish.

Other logs and fir tops were used in a stream improvement project by the WIldlife Biology class to improve spawning habitat and provide stabilization for an eroding bank.

Biology students spend six weeks studying entomology, the study of insects. They learn to appreciate the number and diversity of insects through field collections, keying-out exercises, and art activities in comparative anatomy (antennae, eyes, mouth parts, legs, etc.). As a culminating experience, students have worked on two problems related to insects.

Students monitored the tansy-ragwort population in a neighboring farmer's field. Tansy is considered a noxious weed in Lincoln County because of its toxicity to cattle and horses and rapid rate of reproduction. In a population study of the weed, it was found to occur at a population density of 42 plants/square meter in 1985. Students obtained population of tansy flea-beetles from the Lincoln County weed control expert and released the beetles in the fall after the study. The very next year, random sampling showed 0 plants/square meter, and plants couldn't even be found by searching them out! Since that time, the flea-beetles have continued to spread into neighboring fields, eliminating the need for herbicides on local pastures.

(Top) 7th-grade Forestry students using "misery whip" to thin fir stand. (Bottom) Peeled log is skidded to hatchbox by team of Percherons.



Students evaluate apples for their potential inclusion in school orchard.

A second project attempted to solve an insect problem in a biological way. Two local stock ponds and a mill pond were found to have high population of Culex mosquitoes. A student in the biology class reared a population of Gambusia, the mosquito fish, and released adults into the ponds to prey on mosquito larvae. The same student even introduced a pair of the fish into her horses' watering trough as a mosquito control measure. Both of these introductions, of an insect to control a weed pest, and of a fish to control an insect pest, reduce the need to apply pesticides to our environment and have been good models of creative thinking and safe pest control. It is stressed to students that non-native species should never be introduced into a new environment without prior experiments as to the consequences of the release.

Both Biology and Earth Science classes often discuss controversial topics related to the unit of study. Often students are either required or encouraged to write letters to Senators, Congressmen or even the President voicing their opinions on issues such as energy policy, abortion and population control, acid rain, pesticides, the arms race and other current legislation. The student is encouraged to explore the issue both in and out of class, formulate an opinion and express that opinion clearly in writing. A class bulletin board is used to display letters of response from government representatives who have received the mail. The student learns that congresspeople do care about their opinions and that they can have a say in government policy.

6th-grader planting trees along the river bank for shade and soil stabilization.

The Horticulture class began three years ago with the salvaging of a garden spot from the old school dump site, which had grown up to briars. The area was bulleozed off and a deer fence was built by students and community volunteers. Raised beds were constructed and filled with compost donated by a local farmer. The class uses biological methods to grow fresh produce for the school salad bar. Students also experiment with variety trials, comparing growth, flavor, disease resistance and winter hardiness in crops such as winter lettuce, broccoli, kale, cabbage, tomatoes, peppers, parsley and corn.

For the last two years, a major research emphasis was on tomatoes. Local gardeners had complained for years that all they could get were large green tomatoes on the vine when the frost hit in early October. Nights are typically too cool for most tomatoes to set fruit until midsummer. Horticulture students scoured the seed catalogs for cold-set and early ripening varieties from around the world. They ordered seeds from Canada, England, South America and Japan and colder parts of the U.S. and planted the seeds in the greenhouse. Transplants of each variety were set out in spring and compared for early ripening, flavor, yield and disease resistance. Over 500 plants have been sold to community gardeners who also keep data. four or five varieties have now been selected that will ripen as early as late July and local gardeners are getting their fill of red tomatoes. All this was possible simply because of the genetic variation provided in nature.

This year's emphasis in horticulture is on starting a pioneer apple orchard at the school. For the last 3 years, students have grafted over 900 trees of 41 varieties of apples onto dwarf and semi-dwarf rootstocks to be sold to the community for new orchards and as replacements for old and diseased orchards. These apples are chosen for their ability to produce well in the local environment without the use of pesticides, where apple scab and Anthracnose are common. They are also chosen for other characteristics such as good flavor, good keeping or historical significance. The one acre site is now being deer fenced by the class. This winter, the old pioneer varieties grafted onto modern dwarfing rootstocks will be planted using a variety of spacing techniques to improve yield. Students through the years will be able to compare maintenance of dwarf, semi-dwarf and standard size trees each year as they prune and harvest in an orchard that will have tremendous genetic diversity and historical significance.

Other experiments in horticulture involve greenhouse toads to control slugs, slug trapping with pipes and boards, and experiments with slug barriers around garden plots using lime, diatomaceous earth, and ash. Various winter cover crops are grown side by side and compared for biomass production and nturient qualities. An advanced student is comparing different varieities of alfalfa under different planting and liming regimes.

Advanced Biology is a research-oriented class for the most talented and creative Juniors and Seniors. Practical questions are asked by individuals and the group. One student, in an attempt to determine how far honeybees forage from the hive during different nectar flows, has built a 4-story observation hive for the classroom. Bees leave and enter through a 6-inch pipe in the wall. By marking the

Classroom observation beehive and its student builder and researcher.

thorax of the bees with enamel, he is studying the distance bees will travel to obtain nectar at different seasons. In this way, rural beekeepers can learn how close they can locate apiaries without creating competition.

Examples of class projects are the restoration of Little Elk Creek and an Integrated Pest Managment (I.P.M.) study for the U.S. Forest Service. In the former project, a 1/8th mile of the creek adjancent to the school was mapped, water quality and quantity measured, biological diversity of invertebrates determined and a juvenile fish survey completed. With this information, students submitted a stream improvement plan to the local S.T.E.P. biologist which included plans for a log sill, erosion control of a cut bank, the planting of streamside vegetation and a long-term plan to educate the community as to the importance of a healthy stream ecosystem.

I.P.M. is a system of controlling pests, whether plant or animal, using biological, physical or cultural controls while minimizing the use of pesticides. All of the projects at Eddyville are based on the use of I.P.M. systems, which are consistent with natural processes. In 1984, a court injunction forced the U.S. forest Service to stop using herbicides to control roadside brush. Eddyville's Advanced Biology Class has been awarded a grant to inventory two forest Service roads for species present, identify problems, potential problems and beneficial species and design a low-growing, slow-growing esthetic roadside which will rduce present maintenance. This project is really challenging student creativity and ability to imitate natural systems.

Environmental Education is not separate from science at Eddyville. It is woven into the curriculum to reinforce the importance of the environment to our continued existence as a species. Although we will never fully understand nature's ways, we can at least try to have minimal impact on our immediate environment by imitating natural systems and thinking out solutions before we act. □

Horticulture student cultivates interplanting of cabbage and endive. Endive will be harvested as cabbage gets large enough to shade it out.

Students at Eddyville School compare two varieties of overwintering cauliflower. Photos courtesy of Jeff Mitchell.

Adopt-A-Stream Project on Eagle Creek

Arlington High School

by Michele Wolski

In the fall of 1984, Arlington High School adopted a small, unnamed tributary of the Stillaguamish River. We received a grant from Snohomish County's Adopt-A-Stream program to purchase tools, boots and a camera. With little technical knowledge of stream enhancement, we launched a successful program that has involved over 700 sixth graders, high school students, and community members.

The goals of our project are to provide a direct opportunity for students to participate in an environmental project, to enhance the stream for salmon, trout and other wildlife and to educate students and community members about clean streams.

The 1.5 mile stream was named Eagle Creek in a community naming contest. Eagle Creek flows through a 66-acre site adjacent to our middle school and owned by the Arlington School District. This property, complete with stream, pond, marsh, field, forest and riverine habitats, has become of great value to our project.

Participants in the project are all the sixth grade classes, whose involvement is made more meaningful by their classroom study of salmonids; the High School Marine Biology class; and a group of students who form the Adopt-A-Stream Club. We formed an advisory council consisting of school administrators, teachers, and Department of Fisheries, Soil Conservation District and Tribal Hatchery personnel. This group recently adopted a long-term management and protection plan for Eagle Creek and the property site. As a result, the site was dedicated as "Eagle Creek Environmental Education Center" in the fall of

1986. A hand-painted entrance sign designates the area as protected.

Funding has come from the Adopt-A-Stream Foundation, donations of material and labor from local businesses and community members and fund raising projects by members of the club. Once our project is explained, most contacts are willing to help.

In the past three years students have accomplished many enhancement projects. To complete an initial stream survey, students fought their way through thick brush and wet terrain to assess the water quality with test kits and measure stream width, depth, velocity, and temperature. The results guided us to future enhancement measures. For the past two springs, sixth graders and high school students have released chum and coho fry which were obtained from local tribal hatcheries. to get ready for their eventual return we added new spawning gravel to an 80 yard stretch of stream and are now monitoring the area for siltation or other problems. In May, students assist fisheries biologists in electroshocking; a method of obtaining a population count of emerging fry.

Besides just focusing on salmonid enhancement, we have broadened our outlook to include other wildlife. Wood shop classes constructed wood duck nesting boxes which were placed in trees surrounding the pond. Brush piles were built to attract songbirds, small mammals and snakes. Sixth graders began keeping lists of bird and mammal sightings and studied the area for "traces" of wildlife. to further protect the wildlife, the center was posted for "No Hunting" and this was publicized in the local and school newspapers.

A major focus of this spring's activities will be the planting of red ochre dogwood and native shrubs along the stream banks. We are also developing a plan for the construction of trails to allow access to the various habitats. The high school graphics design and agriculture construction classes will be involved with this project.

Public education has been an important part of our activities. Attractive displays including student artwork and their water testing data have reached students at two schools. this year the 10th graders in Marine Biology will teach 2nd graders about "The Salmon Story," in a cross-school teaching project.

This past November several enthusiastic club members trained as tour lealders at the Skykomish State Hatchery and led public and school tours throughout the next week. They did an outstanding job interpreting all aspects of hatchery operation.

Students took an advantage of a winter lull of activities by researching and writing an interesting brochure on a local marine habitat: Kayak Point Park. The brochure featured local history, natural history and park facilities. It was published with the assistance of the Seattle Aquarium's Adopt-A-Beach program and funded by Snohomish County Parks and Recreation. The writers received awards at a parks advisory council meeting.

Adopt-A-Stream club members are organizing hundreds of slides for a community slide show featuring our project and "tips" on how to protect local waters. It will be shown at schools and town council and club meetings.

To provide students with some background in fisheries, trips are taken to local hatcheries, aquariums and beaches. Speakers are also invited to the classroom to talk to students about local issues or their professions.

In order to communicate the goals of our program and highlight the successes of students we often publish articles in local and school newspapers. this further reinforces for the students that they are involved in a meaningful project that has an interest to others.

The value of this project is more than the enhancement of a stream habitat. Students are gaining an understanding of the complexities of a local system and the challenge of working to improve this system. They are proud of their achievements and learning that their efforts can make a difference. Students and teachers are provided an opportunity to interact in new ways in an outdoor setting. Students' awareness seems to be increasing as Arlington teachers once more point out the small, daring fry to their students. Perhaps in another season Arlington students will stand on the banks and say, as their Japanese counterparts do, "Welcome back, Salmon."

□

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Classroom-Community Salmon Enhancement Project

by Sarah Hubbard-Gray

Photo by Mike Siegel, Seattle Times.

Getting kids hooked on protecting water resources is the goal of an innovative program in which elementary and middle school teachers and students raise coho and Chinook salmon in the classroom.

Created by retired Shoreline school teacher Bob Boye, the program - called A Classroom-Community Salmon Enhancement Project - uses a hands-on teaching approach. From October through April, students watch as salmon grow from pea-sized eggs into fry several inches long in a refrigerated aquarium.

In addition to the classroom project, each participating school has a community partner who raises salmon in an egg box along a nearby stream. by comparing salmon grown in the classroom with those reared outdoors, students learn how urban development affects area streams.

"What began as a classroom science project has grown into an environmental program involving over 30 schools," Boye said. "I believe it's the young people who will help improve water quality and give salmon a chance to survive."

The City of Bellevue, METRO, the state Department of Fisheries, the University of Washington and the Adopt-a-Stream Foundation agree. These groups support the program with grant funds, direct involvement, and assistance. Salmon eggs used in the program are provided by the University of Washington School of Fisheries. The Washington Department of Fisheries approves each project before it begins through a permit system.

To kick off the project, students and their teachers accompany Boye on a field trip to the University of Washington or a nearby hatchery to receive their salmon eggs.

Ten Bellevue schools are involved in the project and the city's Storm and Surface Water Utility provides staff support and assistance for those schools and also raises salmon in City Hall. The Bellevue schools visit the University of Washington's fish-rearing pond near the Montlake Cut to get the eggs. The children watch as instructors and students from the University's School of Fisheries net the salmon in the pond and remove eggs and sperm, or milt, from Chinook and coho salmon that return to spawn.

The University provides a pair of salmon for each school group. Assisted by Boye and their teachers, the students help remove the milky white fluid from the male fish and extract the bright orange eggs from the females.

Later that day, the students deliver half of the eggs and milt to their community partner and bring the remainder back to their school. After fertilizing the eggs, the teachers place them carefully into a large aquarium equipped with special aeration, filtration and refrigeration systems.

During the next several months, the students watch the eggs develop and hatch into yolk-fry, or alevin. Within a few weeks the alevin absorb their yolk sacs and are ready for their first meal. The young fry grow quickly, and by April are ready for release into a nearby stream. The week before spring vacation is declared Salmon Release Week by Bellevue's Mayor. All of the schools release their fish at this time. the City sponsors a release where the public is invited to help.

Throughout the project, students learn about the life cycle of salmon and receive reports on how the eggs and fry are progressing in the community partner's box. By sharing experiences, students learn how water quality problems can threaten salmon survival. They also are encouraged to work on possible solutions and learn how their own and their parents actions around the home can influence water quality and stream health.

Sarah Hubbard-Gray works for the City of Bellevue Storm and Surface Water Utility Department.

Kids Working With Nature: A Cooperative Wildlife Habitat Enhancement Project in the Connelly Creek Nature Area

by Wendy Wollam Scherrer
Bellingham Cooperative School
2710 McKenzie Avenue
Bellingham, Washington

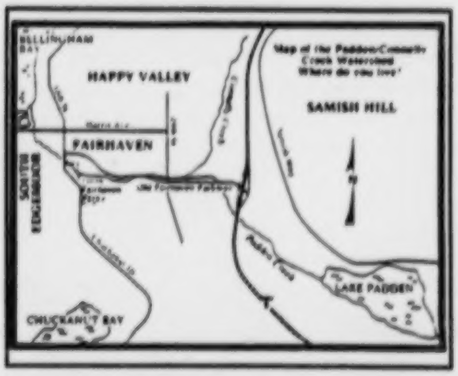
We know today that there is a limit to the number of passengers the planet can carry — human and non-human together. We are all animals with the same basic needs of food, water, protective cover, and space. As people utilize more and more of the world's natural resources, most forms of wildlife have less and less. While scientists, philosophers and politicians deal with the whole-world life-support problem of sharing resources, most of us can be tackling it on a small scale. We can each begin by puzzling about the animal carrying capacity of some little piece of the planet, such as our own backyard, school grounds, or even the local cemetary — places which in some ways can be the most lively areas in town because they still have wildlife habitat and wildlife. What we learn on such lands and the understanding we develop in ourselves and others may well contribute to appreciating and solving the whole world problem.

In one successful project which is now two years old, the Bellingham Cooperative School, along with parents and community volunteers, has been actively involved in a wildlife habitat enhancement effort on a 24-acre parcel of land in Bellingham, Washington.

The Site: Known as the Connelly Creek Nature Area, the project site is adjacent to the Bellingham Cooperative School (a K-6 elementary school) and is within walking distance of three other elementary schools, a large high school and Western Washington University. The long, narrow strip of undeveloped land lies in the Happy Valley neighborhood, a low-moderate income area which has experienced considerable residential growth over the pastt 15 years. With no parks in the large neighborhood, the residents had lobbied for preservation of the undeveloped site to be permanent open space.

A small stream known as connelly Creek meanders through the length of the project site. It is in its natural course through part of the area and has been channelized and was clogged with intrusive vegetation in lower sections of the stream bed. Wetlands and floodplain conditions surround the stream. There are two wooded areas, including what may be Bellingham's only vestige of lowland Sitka spruce forest. The area provides habitat for many species of birds; including green and great blue herons, kingfishers, woodpeckers, raptors and numerous other perching species. Some salmon and trout have been ound utilizing the stream. Deer, coyotes, raccoons, oppossums, and several species of rodents are evident in the area.

Project Background: In August, 1986, the Bellingham Cooperative School proposed to the Bellingham Park and Recreation Department the concept of using the site for ongoing wildlife habitat enhancement and environmental education projects. The Park Board approved the idea ans subsequently an Advisory Committee was formed, composed of a cross-section of community members — including public and private school teachers, students, parents, neighborhood residents, a city councilman, an Audubon Society member, W.W.U. faculty, Soil Conservation Service personnel and others. The committee met monthly for 8 months and came up with a site plan and program entitled the "Connelly Creek Nature Area Plan," which subsequently was approved by the Bellingham City Council in July 1987.



School Related Projects: Simultaneously, while long-term plans were being formulated for the area, the staff of the Bellingham Cooperative School agreed to focus the entire year's science/environmental education curriculum on the theme of wildlife. Classroom and field studies were oriented to various animal and habitat issues. Besides indoor classes, each Wednesday morning, for two hours, children donned rubber boots and outdoor clothing to study the project site. The following activities were accomplished:

1. Observe, sample and record plant communities seasonally.
2. Observe and record signs of wildlife (tracks, droppings, feathers, nests, etc.)
3. Monthly survey of bird populations, with assistance from the Audubon Society.
4. Live animal trapping and observation of rodents (to establish concepts of populations, food chains and habitat requirements)
5. Monthly monitoring of Connelly Creek, under direction of the Institute of Watershed Studies at W.W.U. Children sampled 4 sites along the stream each month to test for depth, width, temperature, water quality, bacteria and dissolved oxygem.
6. Litter pick-up throughout the area. Talk from Litter control Officer.
7. Raising of coho salmon eggs in classroom aquarium. Children kept track of development and released fry in creek.
8. Site plans: each child drafted own site plan, working on the concept of how to maintain place for wildlife and for human access too.
9. School produced "Wildlife 1987" Calendar with kids' artwork and poetry.

(continued)

10. Ongoing projects making murals, paintings, drawings and associated artwork.

11. Several speakers throughout year in classes, including wildlife and fisheries biologists, soil conservation scientists, etc.

12. Students attended City public meetings to apply for funding and lobby for project.

13. Children, parents, and community volunteers worked on several Saturdays to clear stream bed, plant new vegetation, build log weirs for fish habitat and introduce new gravel to Connelly Creek.

14. Used language arts and music classes to write reports, poetry and songs about the Project.

15. Construct and install bird nesting boxes.

A combination of several curricula were used throughout the program, including **Project WILD, Project Learning Tree, Clean Water Streams and Fish, A-Way With Waste, OBIS** materials and other science activities.

Summary: The Habitat Enhancement Project has achieved several things in our shool and larger community. It has been an extremely cooperative project between people of all generations and persuasions.

For the school children, the project has given them new skills, understandings and commitment to the concept of habitat — that "habitat is the key to wildlife." At a sensory, experiential level, they now "know" a habitat, having observed a site over the seasons. They have their favorite trees, know where to find owl pellets, and can tell when the stream looks healthy or not. They now notice when new flowers open up and are eager to record each new bird they've found. The kids are very protective of "their" habitat and notice if anyone has been abusing it.

For the City of Bellingham, it has opened some new possibilities as to what a park may be — that there may be a valid place for urban wildlife and overgrown fields in our neighborhood settings. For the residents of the surrounding neighborhood and other local citizens who have helped on the project, it has given them a chance to remember what the area used to look like and think about re-creating something that somewhat resembles that place. Although Interstate 5 continues to roar away nearby, they realize that we can ensure that places remain where wild animals and people co-exist.

From the viewpoint of fisheries management, we are providing more good spawning and rearing habitat for salmon and trout, which will provide an economic return in the long run.

The project is ongoing, as long-term planning and protection of the area is crucial to its success. In January of 1988, school children will distribute 5,000 brochures to all those residents of the Connelly Creek/Padden Creek watershed. The brochure is to inform all those who live near the stream system that they too have to take care of their watershed.

We have started something in our school, among the students and their families, that says it is important to take care of the local nighborhood environment. We know that this is not an abstract process, but one that is time consuming and sometimes exhausting. But the value of knowing that we are changing our community in a positive way, and in a way that is fun and interesting too, has shown to all involved that it's worth all the effort.

For additional information about this project, see the article in the November/December issue of CLEARING (#51), "An Incident At Connelly Creek" by Denise Lopez.

Habitat is the Key to Wildlife

A song written by Annie, Bess, Danielle, David, Dzhan, Justin, Landry, Megan and Michael. Music and coordination by Geof Morgan.

Dedicated to the smallest creatures on the earth and their habitat

My name is Eustace, and I am a deer mouse
And I want some dinner, and a little house
Fields and grass and stream and seeds
Will provide these things for me

A shrew can't live overnight in captivity
The field is a good place to be free
Animals in this habitat have always called it home
So if you destroy it they'll have no place to roam

CHORUS: *Even the smallest creatures on the earth today*
Are part of the circle, part of the chain
The Great Horned Owl, Coho salmon and the stellar jay
Are calling out to us, their habitat to save

I am a fish jumping up the water falls
I am looking for a place to spawn
I need a place to lay my eggs
I can't go to another stream I don't have legs

The birds that are flying south need a place to rest
So if they are feeling sleepy
They can stop at our bed and breakfast

The coyotes and deer need a place to drink
But if you build houses
They can't go and use your sink

CHORUS

Today we are going out on our site
I am goin' to see a bird in flight
Oh what a simply wonderful sight
I hope I get to see it in daylight

You might want some food, well you won't have any
If you kill the stream, you won't have any salmon
It's got some fish, they've got a life tolive
Oh please don't develop it, just leave it as it is.

CHORUS

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Steps in Carrying Out an Environmental Education Program

from the Environmental Education Guidelines for Washington Schools, a publication of the Division of Instructional Programs and Services, the Office of the Superintendent of Public Instruction, Old Capitol Building, Olympia, Washington 98504, June 1987.

We recommend a systematic approach for developing and managing your school or district's environmental education program. In order to make progress in environmental education, several things are necessary:

- -**Money** to pay for doing what is needed to make environmental education work.
- -**People** who will do the work to make environmental education work.
- -High quality educational **materials**.
- -A **means** of getting the materials into the hands of the people involved in environmental education
- -**Means** to **sustain the dedication** and enthusiasm of the people involved in environmental education
- -A plan for **managing** and coordinating all the parts of the program.

The following planning diagram describes the elements to consider as your program moves forward. The elements are described below, and shown visually on the following chart (figure 1). Consider each of the elements individually, and then examine the relationship of each element to each other and to the whole planning sequence.

Elements of an Environmental Education Program

1. **Authority** is defined by the legal and policy statements at both the state and local level that permit and encourage environmental education program operations.

2. **Planning and management** sets into motion the considerations necessary for each of the system elements to function successfully, independently, in relationship to each other.

3. **Curriculum and learning systems development** is largely concerned with developing, selecting or modifying program materials to meet the pre-stated instructional goals and objectives.

4. **Staff development** provides new knowledge and skill through inservice education of the teachers and administrators who will provide direct instruction and supervision for the success of the program.

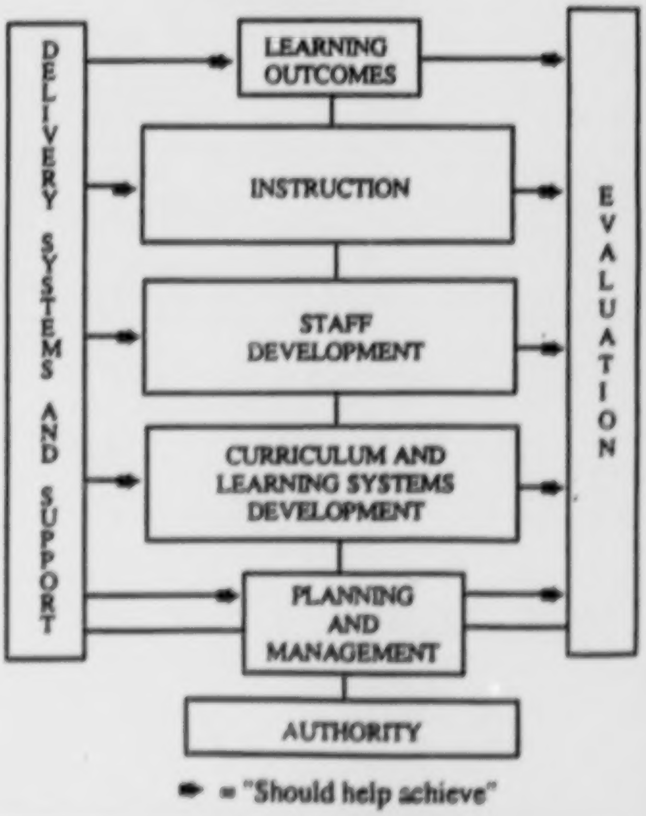
5. **Instruction** includes the conduct of the programs selected in the curriculum area, and should be structured to achieve the goals of instruction.

6. **Learning outcomes** is the realization of instruction and the achievement of the pre-stated goals and objectives of instruction. This component provides the major portion of this document and includes a description of learners after instruction.

7. **Delivery systems and support** includes activities and resources that allow the program to be conducted successfully such as policy, development, financial support, transportation, personnel, media, and management functions at the district or building levels.

8. **Evaluation** is a continuing set of activities which includes gathering data about program functions and outcomes, analyzing them, and providing feedback for planning and management considerations.

Environmental Education Planning Model


DELIVERY SYSTEMS AND SUPPORT
LEARNING OUTCOMES
INSTRUCTION
STAFF DEVELOPMENT
CURRICULUM AND LEARNING SYSTEMS DEVELOPMENT
PLANNING AND MANAGEMENT
AUTHORITY
EVALUATION
➡ = "Should help achieve"

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Staff Development: The Program of Inservice Education

All teachers and administrators will need a planned program of inservice education. Such a program will enable you to review the content, program materials, and instructional strategies so that you can utilize them more effectively.

The environmental education inservice programs have one distinct advantage over most other inservice programs. They deal with critical issues that currently are impinging on the lives of the teachers, students, and their families. Another advantage is that many of these inservice activities can be held in naturally pleasing settings. This in itself can place participants in highly involving and satisfying activities.

Educators who wish to plan effective inservice program should carefully consider the following:

-the present skill and knowledge level of participants
-the other expectations or pressures that teachers are experiencing
-the need to involve teachers and administrators in the planning, scheduling, and implementation of the inservice sessions
-that the sessions need to be practical and consistent with the philosophical direction of the school district.
-the realization that substantial competence exists among the educators themselves resulting in positive peer support and acceptance
-the need to orient outside experts thoroughly to the specific methods and activities that are to be conducted
-the realization that inservice education programs need to be long-term, include follow-up with individuals, provide positive feedback, raise expectations, and result in the changed behavior of the individual.

Types of Inservice Activities

The variety of inservice activities is limited only by the creativity of the planners, time limitations, and cost considerations. The following samples of inservice education activities are only a few of many that are suitable.

Courses and Workshops

University Credit Courses and Workshops
established catalog courses
special purpose, locally adapted courses or workshops

Governmental Agency Workshops
hazardous waste by Department of Ecology
forest ecology by Department of Natural Resources
soil and water conservation practices by Soil and Water Conservation Districts
recycling by Department of Ecology

"Make and Take" Workshops
learning centers
game construction
puzzles
measuring equipment (for example, weather instruments)
teaching aids

Curriculum Materials Workshops
Project Learning Tree
Project WILD
Energy, Food and You
marine and aquatic programs from ESD 114 or Seattle Aquarium

Curriculum Development Workshops
creating new curriculum materials
writing a course of study
choosing curriculum materials

Field Trips and Discussion Groups

Energy and Resource
granary, freight yard
meat packing plant
foundry, quarry
food processing plant
power generating plant
manufacturing plants

History
famous farms
urban restorations

Classroom Visitations
in the same school district
in other school districts

Natural Environment
parks, preserves, forests
lakes, rivers, streams
hiking and biking trails
white water rafting or canoeing

Nature Study Facilities
nature centers, parks, camps
outdoor education centers

Pollution Control
waste water treatment plant
strip mine
soil conservation practices site
reclamation site
recycling center
chemical plant

Animal and Plant Collections
arboretums, zoos
natural history museums
commercial animal collections

Discussion Groups
discussing trends in energy and resource conservation, recent research reports, innovative programs

Don't Mess with Mother Nature

- or -

Loss of Biological Diversity: The Challenge of Today

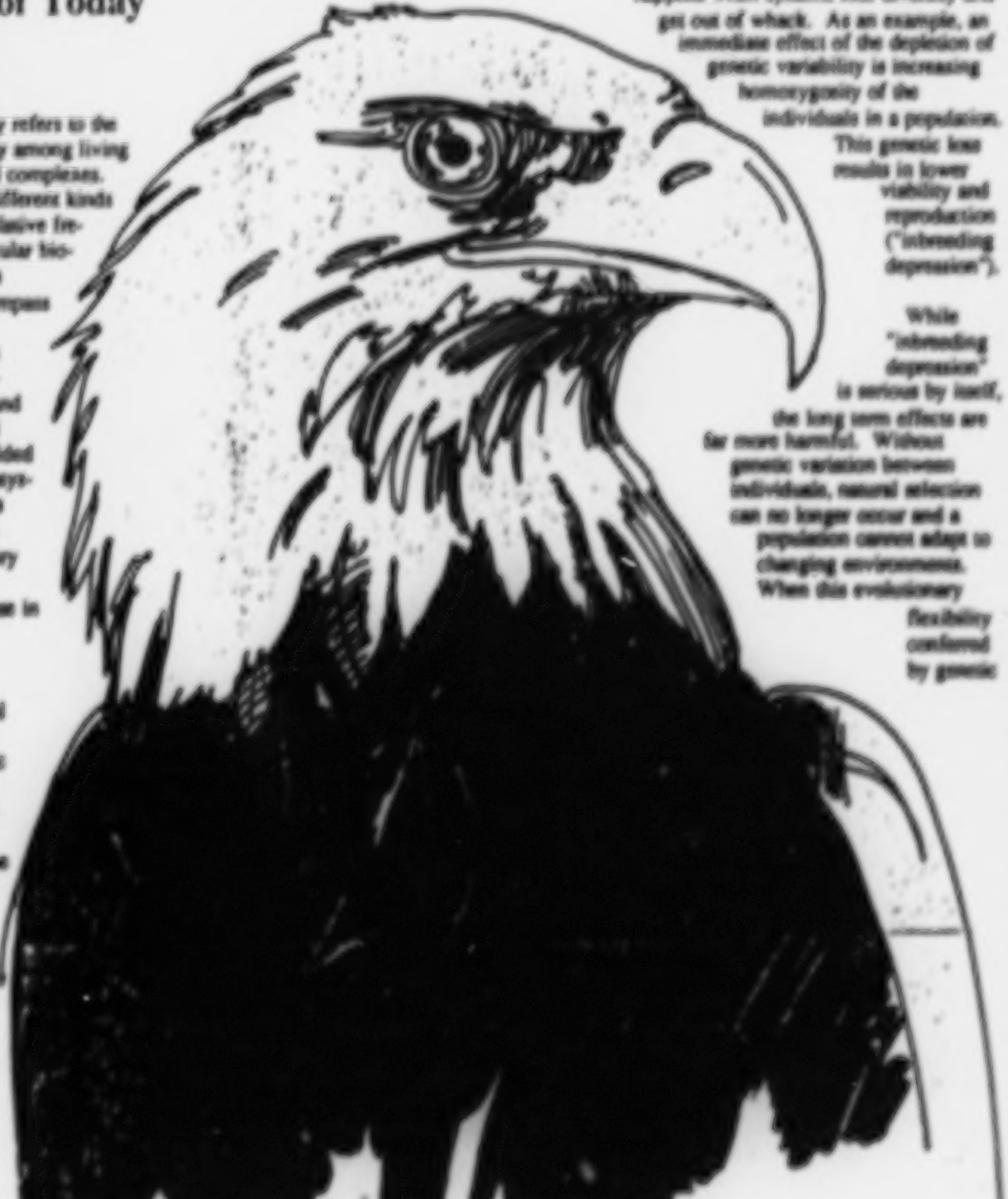
by Orlay Johnson

Biological diversity refers to the variety and variability among living things and ecological complexes. It is the number of different kinds of items, and their relative frequency, in any particular biological system. Such a system might encompass anything from complete ecosystems to biochemical structures such as genes and enzymes. Biological diversity is often divided into three areas: ecosystem diversity, species diversity and genetic diversity. Each is very important and, as is almost always the case in nature, each is interrelated.

Why has biological diversity suddenly become a major topic of interest, and is its loss really as serious as some scientists seem to believe? The answer to the latter question is yes. Loss of biological diversity is as serious as can be imagined. There are estimated to be between 5 million and 37 million species in the world today. Humans, especially in third world countries, are destroying their habitats at an amazing rate. We could well be the generation that witnesses the extinction of as many as one-third (or more) of these organisms. Such a mass extinction is similar in magnitude to what occurred during the demise of the dinosaurs. People are not crying wolf, it is a real and serious problem.

The maintenance of biological diversity is important because of an accumulation of biological data. It is only recently that we have begun to understand what happens when systems lose diversity and get out of whack. As an example, an immediate effect of the depletion of genetic variability is increasing homozygosity of the individuals in a population. This genetic loss results in lower viability and reproduction ("inbreeding depression").

While "inbreeding depression" is serious by itself, the long term effects are far more harmful. Without genetic variation between individuals, natural selection can no longer occur and a population cannot adapt to changing environments. When this evolutionary flexibility conferred by genetic



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diversity is lost, the population reaches a dead end. It is vulnerable to new predators, diseases, parasites, climatic conditions and competitors and to changing food supplies. Extinction is only a step away.

What is the cause of lost biological diversity? The principal cause is the increasing destruction of natural ecosystems for human exploitation. An example of such loss in the Pacific Northwest is the conversion of our natural estuaries into housing developments, marinas, and industrial sites. Another example is the conversion of diverse old-growth forests into mono-crop tree farms. The loss is occurring throughout the world, but especially in areas which have only recently been opened up to intense human exploitation, such as the tropics.

Where are we now? This is the crux of the problem and from ecosystems to gene expression we are simply unable to accurately estimate the rate of loss. It is very difficult to claim something bad is happening when few people can understand what it is and you can't accurately measure it. The situation is particularly prevalent in poor regions where economic development is desperately needed. It is comparatively easy to save the whales, they are tangible objects, but how do you save an adapted pattern of genetic expression?

There are other problems which prevent constructive action to maintain biological diversity. One is that a major loss is occurring in the tropics with extensive clearing of tropical forests, an area where most of us have little experience. "It's not our problem" is probably a common response. Educators must emphasize that this is a world-wide problem, it is just more evident in the tropics. Further, even in the tropics it is still "our" problem. The loss of any species to extinction is a loss to all. Of the food we consume in a week, much is of tropical origin and, at present rates, in as little as 30 years we will have destroyed all of the tropical forests that produced these resources, except for what little is preserved in small parks.

There is another aspect to this issue which is equally important: synergism, the interaction among organisms that is much more than their sum. Part of the reason we have been able to accumulate enough data to recognize the problem is that there are synergistic connections between losses of ecosystems, species and genetic diversity... and these are beginning to be expressed. As gene diversity is lost, a population of a particular animal loses evolutionary flexibility; soon that species is extinct. As enough species disappear, the entire ecosystem collapses, which results in the collapse of other ecosystems with weakened populations. Once such synergistic destruction begins it is almost impossible to stop, and chaos remains.

In conclusion, it is very important to maintain a diversity of plant and animal life. Not just a biotype of a species in a small park, but a wide range of biotypes, races, populations and strains in a variety of habitats and ecosystems. We are unintentionally depleting the world of plants and animals, and if we don't stop we will have to pay a terrible price. Herein lies a great challenge for all educators... we must train both this generation and future generations to maintain the balance of nature, for once out of balance, the old cliche "don't mess with mother nature" can become chillingly real.

Activity

A Question of Diversity

Ages: 10-17

Purpose: For learners to observe similarities and differences among plants of an area and develop an awareness of local diversity.

Materials: 30 paper cups and/or egg boxes — enough for 30 or more segmented compartments per team.

Action: Divide the group into two teams. Have each team stake out claims to territory in the study area, preferably a field or lawn situation. Each territory should be roughly the same size. The leader provides each team with the cups or egg cartons.

The team members then explore their territory and gather a leaf or a small piece of each different plant they find. They should put their specimens in the cups or dividers of the egg cartons. Only one kind should be in any compartment. Each team should find as many different kinds as possible.

After a reasonable period of time, the team members should gather and be sure that only one kind is in a compartment and that each container does contain a different kind. The teams then count up the containers. Which team picked the site with the greatest species diversity? How many of these species do the youngsters have names for? You may want to key out some more.

Reference: Outdoor Biology Instructional Strategies (OBIS), Lawrence Hall of Science, University of California.

Discovering Diversity in the Water Environment

Setting: Outdoors at the edge of a pond, river or stream

Time: One to Three hours

Format: Individual observation and discussion

Purpose: To notice and appreciate the variety of small plants and animals which live in the water.

Materials: Paper and pencil for each person; notebook or cardboard to write

Activity

(continued)

on; and the following if possible: resource information on aquatic organisms, books, dip nets and a small pail.

Concepts: Detailed observation often uncovers an amazing variety of organisms with specific adaptations to their niche. Most environments offer an abundance of interesting discoveries, but the watery world is intriguing because it is usually the least familiar. Your group may enjoy exploring on their own, or they may appreciate learning to identify the plants and animals they find. A resource person may be a helpful addition on this trip.

Procedure: Travel to a place at a pond or along a *river* where you can easily get to the water. Introduce the area as an ecosystem that is full of a variety of plants and animals unfamiliar to most people. Ask the group to spread out along the water's edge (individually or in pairs), and to watch for animals in and on the water for *five minutes*. Encourage them to make notes or sketches of what they see. Then dredge up some of the bottom material and sort through the rocks, pebbles, muck or sand for other organisms. Check the bottom of rocks in a fast-moving area of the stream for clinging insects. The dip nets can be used to catch animals moving through the water. Collect the organisms in the pail for closer observation.

Later, exchange the findings, drawings and descriptions with the entire group. Discuss the diversity of animals or the lack of it. Speculate about the purpose of visible adaptations. Identify unknown species with the help of a field guide. The activity is useful for comparing two areas — polluted and unpolluted ponds, quiet and fast sections of a river, or shallow and deep areas of water. Before you leave, return the animals to the pond or river.

Other ideas...

1. Have each of your students research a threatened or endangered species (you might want them to choose animals from the Pacific Northwest), reporting on its status, current numbers, habitat needs, cause of endangerment, and current management and protection practices. Have students create a display of their chosen animals. *(Environmental Education Information Report)*

2. Have a schoolwide contest in which students create posters honoring endangered species — from plants to wildlife. *(Project WILD)*

3. Write a short essay, poem, or song about plants and animals facing extinction. What are these organisms "worth?" What are we humans losing? *(Project WILD)*

4. Find out what is being done concerning the endangered plants and animals in your state or province; at the national level; at the international and worldwide levels. What can each of us as individuals do? *(Project WILD)*

5. Explore the possibility that extinction can apply to human cultural forms; e.g., traditional languages, native peoples. *(Project WILD)*

6. Explore the concept of "unendangered" species. What animals appear not to be endangered at all at this time. Why? *(Project WILD)*

7. Play a game of musical chairs. Students will represent different species of animals, and the chairs will represent habitats. As the students walk around the chairs, the teacher reads about a current cause of habitat destruction. As each card is read, a habitat chair is removed. When the music stops, students attempt to sit in remaining chairs. The students unable to find a seat become extinct. Each student/animal who becomes extinct reads the next habitat destruction cause. When all the students/animals have become extinct, discuss with them the need for habitats and the causes of extinction. *(Global Tomorrow Coalition)*

Resources

Biological Diversity, a learning packet developed by the Global Tomorrow Coalition, 708 S.W. Third Ave., Suite 227, Portland, Oregon 97204 (503) 295-0182.

World Conservation Strategy: A Programme for Youth - Manual for Youth Environmental Projects, prepared by the International Union for Conservation of Nature and Natural Resources (IUCN), the United Nations Environment Programme, and the International Youth Federation, 1986.

See *CLEARING* #48 (March/April 1987) for a listing of additional resource materials.

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Teaching for Environmental and Social Responsibility

by Marion Dresner

The major focus of environmental education programs in schools and other institutions has been in appreciation and knowledge about the natural environment. However, environmental education has developed with a mandate to teach not only for awareness and knowledge about environmental systems, but also for the development of the attitudes, skills and motivation to take action on critical environmental issues (Stapp, W.B., 1970).

Many of our existing educational curricula and teaching strategies fall short of this goal. We find ourselves in a society where only a handfull of individuals actively participate in environmental and social issues. Although Americans have continued to rate environmental quality highly as a major concern, little substantive progress has been made in environmental protection over the past twenty years. And for all our rhetoric about democracy, the overwhelming majority of Americans continue to participate in our decision-making processes in only the most perfunctory ways in redressing the issues that directly affect them. Generating more active participation is desirable as a means towards greater social and environmental reform.

This situation is due in part to what goes on in school. Most teachers do not teach directly for participation. It is commonly assumed that citizenship will naturally evolve from learning content or from passively discussing action. Teachers can teach for the development of skills leading to active participation using behavioral intervention strategies. The corresponding attitudes of environmental awareness are necessary as a source of deep relatedness to the natural environment from which individual choices to act can be made.

Taking action isn't sufficient unto itself. There is an intimate connection between citizenship, moral integrity and critical thinking. Teaching critical thinking is a means to moral development and is the basis for responsible citizenship. Many people are unable to see through and critique the propaganda and mass manipulation to which we are continually subjected. Advocates of critical thinking pose a method of teaching for fair-minded independent thought. Students learn to think for themselves through having their own lived experiences included as an essential part of the subject matter done in an analytic manner.

The critical content of any learning experience is the method or process through which the learning occurs. In other words, what the students DO in the classroom is what they learn. What students mostly do in class is to passively guess what the teacher wants them to say. But what is really worth knowing? If students have a central role in framing questions that they deem important, they become active producers of knowledge. If this process is included with the development of skills to be able to look critically at the topic and ask what the real issues are, then the students are being empowered.

Students rarely have the chance to develop the skills necessary to think and act in an environmentally responsible manner due to the authoritarian nature of most schools. If a student has no rights, they develop no responsibility.

"The only kind of learning which signficantly influences behavior is self-discovered or self-appropriated learning that has been assimilated into experience." - Carl Rogers (1979)

As a beginning, a teacher can both model and teach for more active participation in the classroom by running the class democratically and doing group problem solving at class meetings. In addition, a teacher models citizenship through his/her own active participation in issues meaningful to her/him.

The Law Related Education projects have published sets of activities and provide workshops in the use of case studies for classroom exercises to foster the democratic process in schools. Included are activities on evaluating and making rules both in the classroom and in society and in critically evaluating our processes for selecting people to fill positions of authority and role evaluation.

In shifting our focus to teaching for participatory behavior, it is useful to look at some of psychological factors having a bearing on an individual's choice to take action. These factors are: personality factors such as attitudes, personal efficacy and perception of personal responsibility, knowledge of the issues, knowledge of action strategies and particular action skills. Additional factors in the situation itself, such as social influence and economic ability determine that the actual behavior will occur. Of all these factors, the personality factors are the least likely to be affected by teaching strategies. Knowledge of the issues, knowledge of action strategies, and actual particular action skills are all able to be affected through teaching (Hines, et.al. 1984).

There are many techniques for teaching about issues and action skills in a participatory manner. Most fall under the heading of providing hands-on experiences with specific action strategies, decision making strategies and alternative solutions to issues. Some of these ideas are presented below:

a) - Adopt a beach, section of a river or of a forest. Keep it clean of trash. Learn its natural history and its history of human land use. Learn which agency has jurisdiction over the area. Invite representatives from this agency to class. What is the area;s protected status? What proposals for its use are pending? If a particular development project is being proposed, prepare an Environmental Impact Statement as a class project. What are the risks, benefits, and alternatives to the project? If there is controversy over the proposed project, invite speakers representing different

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viewpoints about the project to class. Become spokespersons for the natural area, as suggested by Christopher Stone in Do Trees Have Legal Standing?

b) - Place biology and ecology in a real context by studying a current controversial natural resource issue. As a class, choose a particular issue that directly affects you. How is scientific information being used in making publi choices? Perform some of the scientific investigative work (e.g., which marsh plants would be affected by the proposed dredging project?) Learn how to read non-neutral material by looking for the bias and comparing materials written from different viewpoints. Identify the value positions operating in each of the arguments. Learn how to obtain more information from resource agencies. Weighing the benefits, risks and impacts, form positions on the issues. As a class, participate in public hearings about the issue. Send class view-points to the governing agency representatives. Witness the outcome of the decision-making process. Evaluate.

c) - Prepare a role-playing simulation of a particular environmental dispute, such as the Mineral King Development Supreme Court Case. Investigate the background of the issues, including the environmental, social and political factors. Determine all of the relevant interest groups. Give students sufficient time to research their particular positions on the issues in assumed roles as one member of a particular interest group. Select a format for the mock public hearing. Decide on a decision-making model. Hold the hearing and reach a decision. Make sure to debrief the experience with the class when everyone is out of character. Evaluate the experience. How did the actual decision makers decide on the issue? What is the presnt status of the issue?

d) - Conduct a survey in the school, among the students, families, or in the community. Analyze your results, write up the study and send it to a relevant resource agency or government respresentative. Possible topics include:

-attitudes towards garbage, littering, recycling

-attitudes towards air or water quality

-attitudes towards who should pay for pollution clean-up

-attitudes towards endangered species, resource preservation.

There are several notable curriculum available that stress the development of action skills:

Investigating and Evaluating Environmental Issues and Action Skill Development Modules 1985. Harold Hungerford, R. Ben Peyton, Ralph Literland, Audrey Tomera, John Ramsey, and Trudi Volk. Available from:

Stipes Publishing Company
10-12 Chester Street
Champaign, IL 61820

INVESTIGATIONS: TOXIC WASTE. A source Curriculum in the Participation Series. 1984. Jill Goldman. Available from:

Educators for Social Responsibility
7688 S.W. Capitol Hwy
Portland, OR 97219

Resource Access Project: Linking the Classroom to the Coastal Zone. 1987. Neil Maine and Linda Newberry. Available from:

The Dept. of Land Conservation and Development
1175 Court St. N.E.
Salem, OR 97310

☐

Activity

Estuary Management

(from Resource Access Project, Maine and Newberry, 1987)

Goal: (Social Studies) Estuaries must be managed in such a way as to protect marsh systems, and still allow community development. (Science) Marsh areas of the estuary are critical to the energy cycle.

Student Background: Plants found in estuary wetlands are very important to the health of an estuary. In order to protect the plants from damage, we must develop measures (ways) to protect them. To know what rules to make, we need to know more about how the marsh plants live.

Certain plants like to live in special places where they get covered by water some of the time, but not all of the time. One of the main events in the daily life of the estuary is the rise and fall of the tides. If we can find out where the tide falls, and where the special places are that plants like, we can use this to help make plans or guidelines to protect wetland areas.

Student Instruction: 1. Using the following **tide chart** for your information, ***make a dot*** indicating the tide level, straight up from the appropriate time (on the lower part of the chart). This will tell you how high, or low, the tide is, at that particular hour. The first one has been placed for you. ***Continue doing the same*** all the way across the page. When all of the dots have been placed ***connect*** them with a gentle curved line. This will show you the **TIDE CYCLE** for one lunar day (since tides are caused by the moon, we have to think about how long it takes the moon to get around the earth.)

TIDE CHART

1:00 am	8.2 ft.	1:00 pm	3.0 ft.
2:00 am	6.1 ft.	2:00 pm	2.2 ft.
3:00 am	5.0 ft.	3:00 pm	3.4 ft.
4:00 am	4.5 ft.	4:00 pm	5.5 ft.
5:00 am	5.0 ft.	5:00 pm	8.5 ft.
6:00 am	7.1 ft.	6:00 pm	8.8 ft.
7:00 am	8.7 ft.	7:00 pm	9.0 ft.
8:00 am	9.8 ft.	8:00 pm	8.8 ft.
9:00 am	10.2 ft.	9:00 pm	8.1 ft.
10:00am	9.8 ft.	10:00pm	7.4 ft.
11:00am	8.2 ft.	11:00pm	6.2 ft.
12:00am	5.5 ft.	12:00pm	4.5 ft.

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Activity

2. Studies have shown that estuary plants like to live in the tide ranges show below. ***Draw a line*** showing the area within the tidal range that the plants like to live. ***Color them*** according to the following color scheme:

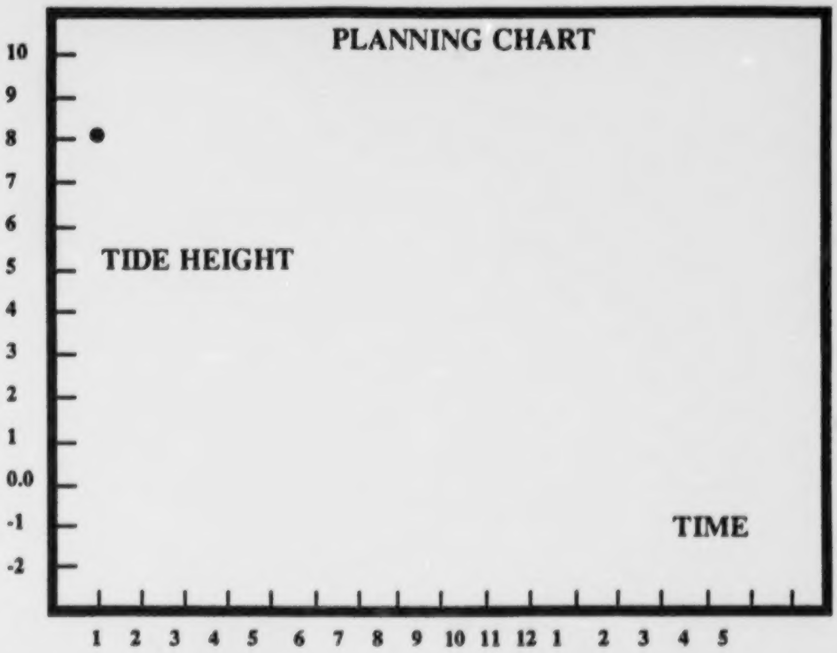
ALGAE - blue
LYNGBY'S SEDGE - green
ARROW GRASS - yellow
PACIFIC SILVERWEED - gray

NAME: **ALGAE**
4 ft. to 5.5 ft.

NAME: **LYNGBY'S SEDGE**
5 ft. to 9 ft.

NAME: **ARROW GRASS**
6.5 ft. to 9.5 ft.

NAME: **PACIFIC SILVERWEED**
9.0 ft. to 11.5 ft.



3. • Using your completed chart, ***make a red line*** where you think it would not be good idea to cover the plants with fill.

• ***Draw a brown line*** where you think it would not be a good idea to dig out the estuary.

• ***Make a list*** of the type of activities that would not damage the marsh. (For example: bird watching from a raised viewing platform).

• ***Write*** rules that you think would give your marsh complete protection.

Mock Congressional Hearing

In 1970, students and faculty at Durham High School in Connecticut began complaining about an unusual odor in the school's drinking water. Tests indicated that the water was contaminated with the solvents tetrachloroethylene and chloroform. Subsequent investigations determined that the most likely source of the contamination was an impoundment on the property of Sibbley, Inc., a metal plating operation located within a few hundred feet of the school water well. Although discharges into the impoundment have been stopped, the school must continue to use an activated carbon filter system to cleanse the contaminants from the water. (Epstein, S.S., Brown, L.O., & Pope, C. Hazardous Waste in America. San Francisco, Sierra Club Books, 1982, pg. 84).

Your class will hold a mock congressional hearing on the toxic waste problem in Durham, Connecticut. Groups of students will act out different positions in the controversy. The role playing should be based on the history given above and on the information obtained by students on investigating current issues. Your group should discuss its stand and appoint one spokesperson. Depending on your role, it might be helpful to contact similar people in your area and ask them how they would react in such a situation. For example, the people playing the governor's representatives could contact the governor's office or the state office for environmental affairs. Try to be as true to your part as possible without letting your own feelings interfere. After hearing testimony from all participants, the members of the congressional subcommittee will decide on how the problem should be handled. Their options are: to do nothing, to provide money from the Superfund with or without sueing the generator for restitution of this money, to mandate a state supported cleanup, or to mandate that the generator conduct the cleanup. They should present and explain their decision.

Roles: 1. Students and faculty of Durham High School. 2. Parents of students attending Durham High School. 3. State Dept. of Solid Waste Management (the agency that discovered the contamination after complaints from the school). 4. Representatives from governor's office. 5. EPA experts on toxic waste. 6. Sibbley, Inc., the generator. 7. Representatives of several other companies in the area that also generate hazardous waste. 8. Representatives from the mayor's office (consider whether the town wants to jeopardize its image and whether it wants to scare aware industry). 9. Environmental group. 10. Congressional subcommittee members.

Reference: Investigations: Toxic Waste, from Educators for Social Responsibility (see Clearinghouse)

Environmental and Cultural Education — Teaching Care for the Earth

by Michael J. Caduto, Consultant, Norwich, Vermont

Education springs forth from life. It is a pursuit of values and moral issues, as well as knowledge. We do not experience the world with our minds alone; our emotions and actions are vital parts of our total being. Moral education addresses our thoughts, feelings, and conduct toward ourselves, other people, and the environment.

We are one in relationship with the earth and other people, doing good supports this relationship. Love and moral goodness are inseparable, they are the elemtnal components of a life ethic.

Environmental education, if it is to grow and endure, needs to include moral education as well as the social and cultural aspects of the "wholistic" world that it seeks to nurture. If there is truly a oneness between a cottony milkweed seed blowing over a late summer field in Pennsylvania and the saguaro fruit eaten by Papago Indians in the Sonoran Desert of Arizona, between the busy sounds of Toronto on a bustling afternoon and the muted cries of a hungry child in the slums of Calcutta, then somehow our teaching must reflect this trans-global unity.

Just as environmental educators have stressed that damage done in one place affects the earth's ever-widening circles of life, so too does healing spread like the roots and branches from a sprouting seed. Our behavior toward the environment reflects the way we act in social and political settings.

There is an uncanny resemblance between our behavior toward each other and our behavior toward the earth. By some connection we do not recognize, the willingness to exploit one becomes the willingness to exploit the other... It is impossible to care for each other more or differently than we care for the earth.

The struggle against destructive and repressive forces walks in tandem with our efforts to foster healing and caring ways of living with society and the environment.

The importance of approaching values and moral issues in environmental education has been recognized throughout the world. Participants at the 1977 Intergovernmental Conference in Environmental Education in Tbilisi, Union of Soviet Socialist Republics, recognized that ethical values should be taken into consideration in developing environmental education programs, and that environmental education should be aimed at creating an awareness and values directed toward improving the qualities of life. Environmental education programs in many countries include values and moral issues in the environmental education curriculum.

How and why do people make their decisions? What are the attitudes and values that their conduct is based on? A brief look at the theories of moral development help us to understand how values form and change.

Volumes have been written analyzing the psychoanalytical theories of Sigmund Freud and Erik Erikson, as well as the social learning theory which holds that values are formed through positive and negative reinforcement of behavior.

The moral development theories of Jean Piaget and Lawrence Kohlberg have become the basis for many modern values education programs. Piaget and Kohlberg propose that moral development occurs in distinct stages that are a natural, hierarchical progression during a child's growth. Younger children are morally dependent upon the rules of authority figures, while older children and adults become morally autonomous beings whose conduct is guided by personal moral standards. A lively debate continues over the research methods used by Piaget and Kohlberg, the composition of their audiences, and the strong male bias inherent in their theories, which view female behavior as a deviation from the male-oriented norms. Studies show that males favor the separateness of the individual self over connection to others and lean more twoard an autonomous life of work than toward the interdependence of love and care. Carol Gilligan points out that

> In the different voice of women lies the truth of an ethic of care, the tie between relationship and responsibility and the origin of aggression in the failure of connection. Women's development delineates the poath not only to a less violent life, but to a maturity realized through interdependence and taking care.

In women's development there is a fusion of justice and love — the kind of concepts and conduct that environmental educators try to teach — a sense of being a part of the environment, wholism, and interdependence.

Environmental education programs also need to consider spiritual and religious values. Environmental values should be an important part of theology and religious teaching. Richard Baer puts it well: "Until we recognize that man's spirit itself is the ultimate frontline of the environmental crisis, we will continue to nibble away at the edges."

In Bringing Up a Moral Child, Michael Schulman and Eva Mekler propose three important foundations for teaching positive oral intentions and a sense of being fair and just:

Internalization occurs when a child has developed an inner voice that guides her or his actions and is based on standards of "right" and "wrong" as learned from parents, teachers, and other adults. This inner voice guides the child away from selfish and aggressive tendencies and provides self-control before an action is taken.

Empathy provides a valuable sense of being connected with our environment. If we feel what another person feels, or can project an emotional feeling into a tree or animal (sad, glad, hurt, happy), we want to help because we share that pain, joy, or other emotion.

Personal Moral Standards allow a child or adult to function as a morally autonomous person living according to standards that are held true no matter who agrees or disagrees with them. They are more effective if applied in a democratic teaching situation.

In several earlier articles and a forthcoming book, I have proposed a wholistic approach to teaching environmental ethics. This plan is structured around the general concept of moral development and the moral education strategies of values analysis, values clarification, action learning, confluent education, inculcation, and behavior modification. Each of these values education methods needs to be carefully considered in light of the teacher's skills and background, the needs of the audience, and the learning situation at hand. Space limitations prevent a detailed discussion of this program here.

With continued work in developing and using methods for teaching environmental ethics, the environmental and cultural links described at the beginning of this article have proven to be fertile ground. In particular, the study of American Indian cultures and their beliefs, as revealed through their lives and stories, offers great promise. .

At first this idea may seem worn, for Indian study is and has been part of many environmental education programs dating back to the founding of the Boy Scouts and Girl Scouts in the early 1900s. Here I propose a perspective of realism that moves beyond our romanticizing of the American Indian. The circles of giving and receiving that form the basis for the Indians' relationships with each other and the earth can be applied to today's environmental and social realities. This teaching occurs, as Paulo Freire puts it, in a dialogue between teacher and learner that fosters love, hope, and critical thinking.

There is a movement afoot. It grows from the need to heal our relationship with the people who first greeted European immigrants to this country. The past three centuries have left deep wounds because of our historical and contemporary oppression of the Indians and environment in America. Native peoples' healing ways are a paradigm for the answers to our own search for reconciling our driven Western lifestyles with our intent to live whole, healing lives, both for ourselves and as an example for others.

Our need for growth encompasses not only the spheres of science and intellect but the cultural and spiritiual realms as well; to seek the "is"-ness of existence in time unpassing. From the seeming ambivalence of intuition and feeling come our greatest insights. Conscious thought can guide our dreams, but it cannot create them. With the greatness of our understanding of the oneness we share with the earth and all people, a sense of humility replaces the hubris of the past. On the infinte plain of life our human thoughts and deeds are small — a mere dimple on a sand grain scoured and bleached at sea's edge. When a tiny seed riding on the wind appears as a planet, an entire world, then we will be reaching toward the connected center of all life. ☐

(Reprinted from the proceedings of the 1985 conference of the North American Association for Environmental Education, P.O. Box 400, Troy, OH 45373)

Checking on the status of environmental education in your school

Of course, assessing the current status of environmental education is the first step towards determining needs. The following checklist is provided as a tool for an informal overview of your program. The answers become a foundation for working toward improvement.

The administration:

☐ Encourages teachers to use schoolgrounds, the surrounding community, or field trips regularly and frequently for instructional purposes.
☐ Makes teachers aware of environmental education in-service training programs available in the area.
☐ Has recently set up a local environmental education in-service training program in the system.
☐ Is establishing and promoting environmental education curriculum exploration and/or development committees.
☐ Experiments with interdisciplinary approaches to education.
☐ Regularly informs teachers of new materials available in environmental education.
☐ Has established one or more outdoor classroom areas. These areas are used regularly by a number of classes.

Instructional activities:

☐ A number of groups actually explore the community to learn how it functions and what its problems are.
☐ Opportunities are presented regularly for students to participate in environmental action projects that enhance their sense of self-worth and feeling of community involvement.
☐ Some classes participate in a resident outdoor education program.
☐ An environmental education program has been developed and implemented in all grade levels.

The school system:

☐ Has one or more people specifically assigned to focus at least half-time on environmental education affairs.
☐ Has distributed environmental education guidelines to teachers.
☐ Encourages teachers to increase their background in environmental understandings.
☐ Has stocked libraries and curriculum materials centers with materials related to environmental education.
☐ Has a citizens advisory committee that recommends environmental education policies.

Guidelines for development and use of environmental education materials, programs, activities

General considerations

Worthwhile and effective environmental education programs, activities, and materials *should:*

☐ Have clearly stated goals and objectives in terms of expected student behavior.
☐ Treat controversial issues fairly and honestly.
☐ Be concerned with helping students learn *how* to think, not *what* to think.
☐ Be sensitive to human values and avoid racial, sexual, occupational, regional, and other stereotypes.

Development of materials

Effective educational programs and materials result when:

☐ Teachers are involved in developmental process and design stage.
☐ Clearly stated and measurable educational goals and objectives are established early in the developmental process.
☐ Materials are designed to be compatible with ongoing educational activities, adopted courses of study, and curriculum frameworks and guidelines.
☐ Allowance is made for teacher creativity and innovation.
☐ Materials are targeted to specific grade levels and subject matter areas.
☐ Materials are convenient to use.
☐ Test instruments and evaluation suggestions are provided.

Program implementation

An effective implementation plan is needed if educational programs and materials are to be of maximum effectiveness. A good implementation plan:

☐ Includes provision for instruction of those who will be using the materials.
☐ Makes use of services available through professional associations, institutions of higher education, state departments of higher education, state departments of education, and local organizations.

Evaluation

The value of programs and materials is determined by their effectiveness. Evaluation is, therefore, a key program element and should provide for:

☐ Field testing and evaluation of programs and materials in terms of stated goals and objectives.
☐ Continuous feedback and modification as needed once a program is underway.

Conclusions

As educators and those who support effective school programs, our activities are future-oriented. How well we do our job will be evident in the communities, our nation, and the world 15 or 20 years from now. Youngsters must understand that all human progress is dependent on a supply of natural resources and a livable physical environment, and that spaceship earth requires constant care and attention. We trust that the materials and check list contained here will be of value to you and that you will continue to support programs and activities to meet this important educational need.

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Going against the Grain

Recently I filled two very different requests for materials needed by marine educators. The first required nothing more than my signature on an invoice for a personal computer. Of course the personal computer wasn't the only item listed. The PC, I have discovered during a stint as an administrator, is the camel's nose beneath the budgetary tent. Hulking after it are a keyboard, software, hard drive, printer, modem, cable accessories and various peripherals. Then comes the second hump with its workstation furniture: split-level desk with tiltrise stand, printer table, miniprinter stand, and finally the chair designed according to the principles of ergonomics (the science of sitting painlessly all day).

I signed the invoice. The specialist convinced me she needed most of the things on it to perform her job in a way that would keep our institution in step with advances in science education. Maybe I signed too quickly. Next, I fear, will come the request for equipment to reach the public through computer-assisted interactive videos. I understand that, elsewhere, interactive videos have been praised for their ability to personalize and reinforce the learning experience, thereby improving the probability of cognition and long-term retention . . . . Still, there *is* the budget to consider.

The second request came from an Illinois eighth grader. She wrote to me a month ago, asking for some Oregon beach sand. She needed it for a school science project in which she was comparing sands from around the nation.

There wasn't a moment to lose, as is ever the case with school projects, so I stopped at Newport's Nye Beach that evening and collected half a cup of guaranteed Oregon sand from the edge of the sea. By flashlight it looked darker than what I'd expected, and by sunlight the next day it still looked too dark; but I sent the sample off anyway, trusting science to present our true colors in Illinois.

Marine Education

At the time I wondered whether sand was the best material to be comparing in a project about beaches. Certainly the choice was more original than if she had chosen, say, shells. But would the effect match that produced by an array of limpets, conchs, whelks and clams? Or would it be about as impressive as a comparison of coffee grounds from cafes around the country?

Initially my vote went for the shells. Or even for a display featuring fish bones or seabird feathers or beer bottles encrusted with barnacles.

Yet my mission to Nye Beach kept coming back to me. The purposeful walk down to the surf. Scooping up sand at the edge of the continent in a styrofoam cup. The gritty feel on my fingertips, telling of substance. And, ultimately, standing there in the dark, imagining packets from Oregon and Texas and Florida on their way to a girl in Illinois, a girl whose simple request and careful script made the recipients of her letter want to help.

I kept some of the sample for myself. Two days later I placed a pinch on a microscope slide and added a drop of salt water. At 40 magnifications the dark sand became a pile of bright grains. Most of them were glassy, though yellow and red and blue-black grains studded the collection. All were of a size. Some had facets that caught oblique light and turned to silver. Others were roughened and round.

Looking at the grains made me contemplate their origins. I thought of headlands worn by a surf that never stops. I thought of Rocky Mountain peaks eroded epochs ago and borne by water down to the Pacific or the Gulf of Mexico. Were there, I wondered, contributions from the living past in all this seaside jewelry? Searching through my pinch of sand, I found fragments of shells and bones that had come to rest within the beach, itself a grinder and a polisher.

Geologists, no doubt, could put names to the grains. Rutile or glauconite or garnet, perhaps. They might also find evidence of Pleistocene windstorms in pitted surfaces, or of glacial meltwater in minerals from Canada. But those of us weak on the particulars of earth science must fall back on our imaginations as we plumb the ancestry of sand. I suspect many imaginations were aroused recently in Illinois.

Only a slope-headed Neanderthal would dare question the necessity of computers and interactive videos in today's instructional institutions. I will say, though, that I'm grateful to the eighth grader who gave me a lesson on the value of looking at the thing itself. Beyond that I can only add, "Ugga bugga, Alley Oop."

—Dan Guthrie

Earth Is Home
whole learners for

by Cheryl Charles

This article is excerpted from a keynote address presented to the Midwest Regional Environmental Education Association Annual Meeting, held at the Springbrook Conservation Education Center in September of 1984 near Des Moines, Iowa.

Whole learners for a whole planet. We begin whole, and we're taught to lose some of that sense of wholeness along the way in our schooling and living. But the capacity for wholeness is always there. And the capacity for renewability is there. Renewability — that's the inherent capacity for continuing life. We need to both celebrate it and sustain it — and the first most powerful perceptual shift we can make in order to do so is to recognize that we are whole learners on a whole planet.

What are the characteristics of whole learners? Whole learners have access to their capacities to learn. Each of us may have predispositions and preferences for ways of processing information. Some of us, for example, are more tactile than others; some like to watch before even considering leaping in to act and even then may not. Others leap first, and think later. Those differences are enriching to society as well as to each of us as individuals. But there's a profound difference between preferring ways of learning, and being prevented access to a diversity of ways of learning. Whole teachers and whole parents open the doors to legitimize each learner's access to a diverse range of ways of thinking and knowing. That is our responsibility.

Each learner has capacities for reasoning, abstraction, and logic. Each of us has capacities for intuition, creativity, and simultaneity. The research related to the differentiation of functioning of the left and right hemispheres of the brain helped us as educators to legitimize our efforts to bring a variety of ways to instruction to education. But we never were talking about "left-brined" students or "right-brained" students, even though some people used those terms. When talking about capacity, the important concept was always that each of us has a whole brain.

Shifting to "styles of learning," the current work of Bernice McCarthy, Bob Samples, Bill Hammond, and others helps us understand again that when in doubt as educators, opt for diversity. Every group of students with whom we work will have a range of preferences for processing information. Bernice talks about the Quadrant One learners who need to know "why": why be involved, why care, what difference does it make to me? She talks about the Quadrant Two learners who want to know "what": just deliver the information in abstract, analytic terms and athey'll take it from there... the students traditional schools were made for. There are the Quadrant Three learners for whom a lot of the hands-on laboratory approaches to science were made — those who want to touch the world, see how it works, take it apart, and put it back together again. And then the Qudrant Four learners who like to invent, innovate, and trasform anything they hear or see into something new they can share and teach to others.

It does appear that most individuals in our culture have some preferences for one of these styles over the others — but again, I think the most important idea is to remember that each of us has capacities for all of these ways of learning. We are each enriched the more flexible we become in terms of the ways we use our minds. As inhabitants of this planet, we need to most profound set of flexibilities and talents to successfully deal with the planetary problems of human and natural resources which face us. And so, as educators about people, responsible actions, and the environment — we must remember to celebrate, nourish, and sustain whole learners on a whole planet.

What are some of the things we can do?

1. Don't give up the earth for efficiency. Keep doing what you are doing — remembering to start with the earth itself. This does not mean maintaining the status quo, but it does mean there's a healthy trend to support continued efforts and actions. That is, each of you who is making an effort in your day to day living and working to keep the life

For Us All
a whole planet

in teaching, to start with the living world, going outside as often as possible to touch it and learn about it — each of you should keep up those efforts. Whether it's working with a few students a week in a preschool to serving as a volunteer at an outdoor residential center to teaching fourth grade in the city and incorporating earth-based units into your curriculum to conducting hundreds of workshops for teachers in a year to fronting the political battles to get the terminology and the concepts out to business and industry... Whatever it is, if it makes sense to you, seems appropriate to your talents and interests and concerns, keep it up. None of us can do it all. We each take a piece that seems manageable and appropriate and do the best we know how to do.

2. Diversity and flexibility are requirements for survival — therefore opt for diversity and flexibility. In materials, in instructional approaches, in audiences with whom you work, in people with whom you cooperate, in instructional strategies, in approaches to funding, in people and programs and ideas you support. Some have said, for example, we don't need another environmental education project — like Project WILD, or Project Learning Tree, or the CLASS Project. My response to that is the more the better. We're still not doing a good enough job finding ways to engage people in actually effectively teaching about people, responsible actions, and the environment. We need as many ways as we can muster. If we can captivate the imagination and energy of one more person by offering another option, it's worth it. We are not talking about the straw that broke the camel's back. We are talking about finding food the camel will eat, and be nourished by. We are not going to make it with a single approach. When in doubt, consider genetics. We need as diverse a gene pool of ideas as possible for the long-term health of this planet.

3. Elitism leads to extinction — so work for mainstream use of earth-based teaching for whole learners. That doesn't mean mandates. A voluntary approach is still the healthiest, but we do need more breadth and depth. We need whole schools and school systems where concepts, experiences, and skills related to people, responsible actions, and the environment are thoughtfully incorporated at every grade level and in every subject area. We need to dust off scope and sequence, at the same time not losing our flexibility as a supplement at any grade level in virtually any setting. We need to keep up the good work to correlate our conservation and environmental education resources to state and local courses of study, to grade level objectives, and to standards for assessment and testing of competencies. We have designed many supplementary activity-based programs and frameworks to make that possible. We need to work harder than ever to see that it happens. The accountability movement in education is on the upswing again, tied to the basics. This can be an opportunity, not an obstruction. One reason I think we are on the threshold of an opportunity is the new thrust toward excellence in education, with the push especially for science. Most teachers still are frightened and put off by science, but students and teachers are captivated by how the living world works, which tends to be the way we open the door in traditional environmental education. The activities and materials that so many of you have developed for years in conservation, natural resources, outdoor, and environmental education are an exceptionally strong basis for enriching science instruction, simultaneously enriching social studies, language, mathematics, and the other curricular areas. We really can help, and the opportunities are all around us.

4. Honor the whole for quality. We can't lose sight of quality. Quality is good content and good experience combined, based on what we know about whole learners. That means we pay attention to learning styles, use diverse modes of instruction, strengthen the content as well as the process, and, yes, evaluate what we are doing so we can figure out where we are and where to go next. For example, we're doing a good job of developing "awareness." We have to improve the substance of our teaching and learning with more content, but remain "hands on" starting with the earth — and then move from awareness to action, grounded in knowledge through experience. That does not mean we should stop the wonderful sensory and appreciative kinds of activities. It's "Yes, and..." that I am talking about.

5. Maintain balance. Balance heals, fragmentation destroys. Remember how often we are dealing with value-sensitive issues when we are talking about people, and the environment. Look at the increased incidence of unusual alliances being formed in support of quality education. Business, industry, resource professionals, private conservation groups, community organizations, special interest groups, and others are all knocking on our doorsteps with an interest in education. That's healthy — and it's not easy. We can bring diverse groups together who will transcend their differences and cooperate in support of quality education, but the bottom lines are integrity and balance. It's premised on students and their teachers being provided with information, skills, and experiences in an open system where access is valued and fairness is the framework as they come to their own informed and responsible decisions. As Rudy Schafer says, "We need to teach children how to think, not what to think, about difficult issues."

6. Emphasize the positive. Evolution does. Continue using the positive approaches which have characterized conservation and environmental education — not negative and scare-oriented tactics that tend to document destruction of the environment. We can make a difference. It doesn't always feel like it, and the challenges are literally matters of life and death. But we can make a difference, and we start each day inside ourselves. That's where the power begins. We need simultaneously to work hard, and yet not be too hard on ourselves. If we're too hard on ourselves, as well as the students and others with whom we work, we'll be immobilized by the enormity of the challenge and destroyed by fear. We can't afford to be immobilized; we can afford to work hard. Success with tangible and manageable goals breeds success. We need to educate for human responsibility where our efforts and actions extend the options for both culture and nature, people and the environment.

7. Celebrate and nourish yourselves. Fulfilling yourself guarantees you will not be a hollow leader. I don't mean in a narcissistic and navel-gazing mode. I simply mean take care of you. It really does begin with each of us. Each of us, our parents, our children, our friends, our students, the people all over this planet we've never met and can only dream of... all of us have enormous capacities, tremendous talents, and infinite energy when we remember our part in the cyclic systems of renewing life.

It is not a question of limited resources that faces us today. It is a question of our abilities to remember the first source, the first classroom, life itself. It is a question of our capacities to bond... with the earth, with all its forms of life, with each other, and with ourselves. Each of you knows that, and you actively remember it. Everyone knows it, but for some it is buried so deeply, it is smothered and dying. We have to go about opening doors and windows, bringing the life back into teaching, learning, and living. It is one earth, and it is home for us all. What's at stake today is not actually the future of the earth, but our species' capacity to bond with it... and it begins with each of us now.

(More) Fiction and Environmental Education

by Rex J. Ettlin

Two articles in CLEARING (#40 and #41) have launched me on a search for more children's literature with environmental themes or messages. The task is immense, for the subject has not been addressed by many writers or publications. CLEARING's articles are precious in their rarity.

I did find two very useful books: "Once Upon a Time" (Sadker and Sadker, Harper and Row, 1977), a college level textbook for children's literature courses, and "The Comedy of the Fantastic" (Don D. Elgin, Greenwood Press, 1985), an extensive treatise describing the interrelationship between humans' environmental attitudes and literary fantasies.

Sadker and Sadker condemn textbooks for their limited presentation of environmental education. They encourage use of literature because "...Children's books have greater power to involve children affectively and experientially in various environmental concerns... (they) can provide children with a more comprehensive and thorough understanding of the ecology issues..."

Don Elgin examines the reactions humans have to their environment and lists several beliefs typical of human response: "It's us against the environment." "We can control the environment." "We live within an infinitely expanding frontier." "It's the individual that matters." "Technology will do it for us."

Elgin describes how modern humans have separated themselves from their environment and offers that literature can reconnect humans and the natural world "...literature... offers humanity a way to reintegrate itself into the natural world and in so doing, invites a new relationship between itself, its fellow creatures, and the science and literature that create and mirror the world."

With the Sadkers and Elgin in mind, I present the following brief book reviews as a useful collection for incorporating literature into environmental education. With this list and the two previous articles in CLEARING, about seventy different titles are made available to consider.

Animalia, Barbara Berger, Celestial Arts, 1982 (grades 3-5)
Asian fables and stories about Buddha's life. Many interactions showing humans and animals helping each other. Wonderfully elaborate and intricate illustrations.

Raccoons, Donna Kay Johnson, Holt, 1978 (3-7)
A realistic account of a raccoon and her four kits. Extensive and accurate descriptions of raccoon behavior, though they are being fed by humans as though they were pets.

The Cry of the Crow, Jean Craighead George, Harper and Row, 1980 (3-7)
A young girl's conflict with her family who shoot crows as pests. She secretly raises a crow chick and eventually has to decide whether to set the crow free or keep it as a pet.

Dawn, Uri Shulevitz, Farrar, Straus and Giroux, 1974 (K-3)
A grandfather and grandson camp out and go fishing amongst spectacular scenes of nature. A magnificent picture book.

The Earth Speaks, Steve Van Matre and Bill Weiler, Institute of Earth Education, 1983 (all ages)
An excellent collection of quotes and stories including Emerson, Thoreau, Muir, Leopold and many others. A must for any environmental education library. (See CLEARING resources, page 58).

The Goodnight Circle, Carolyn Lesser and C.B. Cartier, Harcourt, 1984 (3-6)
From dusk to dawn, the nocturnal activities of animals are described with truthful and beautiful illustrations.

Hawk in the Sky, Franklin Russell; Holt, Rinehart, Winston, 1965 (4-7)
The life story of a Red-tailed Hawk is described in a naturalistic study. Life cycle, predator-prey, and adaptations are concepts included in the story.

Hook a Fish, Catch a Mountain, J.C. George, Dutton, 1975 (6+)
A girl learns to fish and explores the Teton Mountains. Beautiful nature scenes and the life cycle of cutthroat trout are included.

The Hunting Trail, Ester Wier, Walck, 1974 (3-6)
A life story of a coyote who quickly learns humans are its enemies. The coyote has many experiences as it establishes territory.

Island of the Blue Dolphins, Scott O'Dell, Houghton and Mifflin, 1960 (6+)
In 1835, an Indian girl lives alone on an island. The story focuses on the girl's self reliance and dependence on nature.

Julie of the Wolves, Jean Craighead George, Harper and Row, 1972 (6+)
A young Eskimo girl runs away and becomes lost. A group of wolves take her in. Wolf ecology and natural resources are studied.

The Lorax, Dr. Seuss, Random House, 1971 (K-6)
The Lorax works to save the last truffula tree from the axes of the Oncelers.

Owl Lake, Tejima, Philomel, 1987 (K-3)
Nocturnal activities of a group of owls are described. Excellent picture book for young readers.

The Snail's Spell, John Ryder and Lynne Cherry, Puffin, 1985 (K-3)
A young boy's fantasy trip as a snail. Beautiful and intricate illustrations. Accurate descriptions of snail biology and ecology.

Streams to the River, River to the Sea, Scott O'Dell, Houghton Mifflin, 1986 (6+)
A story of Sacagawea's importance to the Lewis and Clark expedition.

The Summer of the Falcon, Jean

Craighead George. Crowell, 1982 (k-)
A girl raises a sparrow hawk for gaming and [illegible] her knowledge of the natural world. Life and death in nature and explored.

The Talking Earth, Jean Craighead George. Harper and Row 1983 (k-)
A modern day Indian girl in conflict with tribal beliefs learns how animals can show the way to save the earth.

Tucker's Countryside, George Selden. Farrar, Straus, 1969 (4-6)
A city-bred cricket and mouse journey to the country and find [illegible] creeping closer and closer and bulldozers threatening.

Water Sky, Jean Craighead George. Harper and Row, 1987 (k-)
Beautiful nature scenes are interwoven with a story about the Eskimo's connection with his environment and each other.

Where the Lilies Bloom, Vera and Bill Cleaver. Lippincott, 1969 (4-6)
The life of wildcrafters, who collect medicinal plants, is described and a young girl's growing up explored.

Who's Hiding There?, [illegible] Picture Book Studio, 1987 (K-3)
Camouflage is described and shown with clever illustrations.

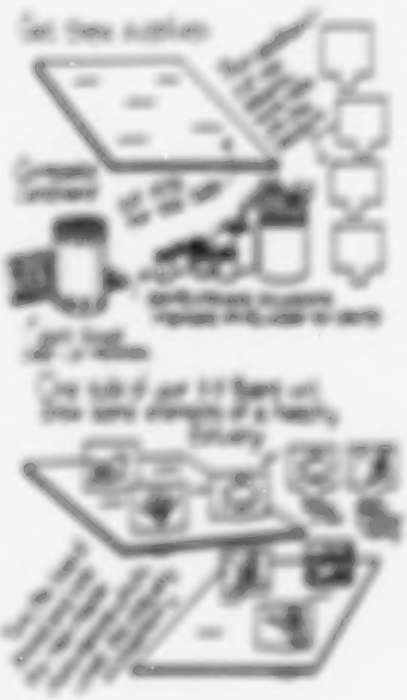
The Wolf, Michael Fox. Coward, McCann and Geoghegan, 1973 (k-)
The life of wolves and the part they play in preserving a balance in nature are described with [illegible] ecological stories.

The Wump World, Bill Peet. Houghton Mifflin, 1970 (K-4)
A peaceful, quiet world is invaded by uncaring and voracious polluters.

[illegible] is an Outdoor School Site Supervisor for Multnomah Environmental Education in Portland, Oregon.

Make An Estuary Environmental Board

[illegible]



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from Northwest Energy News

Is the Planet Baking?

How might the "greenhouse effect" affect the Northwest's energy picture?

by Gordon Lee

Temperature records may not be the first things in the Northwest to go by the wayside if, as many believe, the greenhouse effect has already begun. The first casualties from global warming may be the region's traditional approaches to and assumptions about energy, economics and the environment.

The greenhouse effect — the global warming that's come from 100 years of man-made pollution — could reverse almost all fundamental assumptions about the Northwest and force politicians, economists and planners to rethink basic positions about commercial and social life in the region.

Long-standing assumptions about the region's economic, social and political structures could become obsolete if global warming changes the region's climate. Drier weather, for example, could challenge fundamental notions about the Northwest economy, which for 50 years has been based on abundant, inexpensive hydropower. Water may be neither cheap nor abundant in a warmer, more polluted world, and traditional alternative resources — coal or natural gas — may be environmentally unacceptable.

Already, the greenhouse effect has intertwined politics, power planning and pollution in the Northwest. A citizens group in Washington is circulating an initiative petition that would limit construction of new fossil fuel plants in that state. Before any new power plant that emits carbon dioxide could be built, the measure would require that an equal or greater amount of that gas be reduced from other power sources in Washington. Many scientists suspect carbon dioxide to be the prime, but not sole, culprit in global warming.

Washington's initiative drive followed moves on the national scene this summer. Senators Timothy Wirth (D-CO) and Bennett Johnston

(D-Louisiana), chairman of the Senate Energy and Natural Resources Committee, in July introduced a bill that calls for a 20 percent reduction of carbon dioxide emissions from the United States by the year 2000 and a 50 percent reduction by 2015. Senators Robert Stafford (R-Vermont) and Max Baucus (D-Montana) offered a bill at the same time calling for regulatory reforms that would eliminate the sale and use of chlorofluorocarbons (which, in addition to contributing to greenhouse warming destroy the globe's protective ozone layer — see accompanying story) in the United States by the year 2000, reduce carbon dioxide emissions by 20 percent by 2015 and set a goal to generate all domestic power from non-polluting energy sources by 2000.

The stakes are enormous. Warmer global weather could upset the rhythms of life as we know it by altering precipitation patterns, changing growing seasons, making fertile regions arid, flooding coastal regions and causing mass population migrations.

The Northwest Power Planning Council is in the early stages of addressing the greenhouse effect. "The Council plans to review all the current research and solicit advice from national experts," says outgoing Council chairman Morris Brusett of Montana. "In the coming year, we may publish issue papers for public comment and discussion on the implications of global warming for the regional power plan."

With its international implications, the greenhouse effect may be the most bedeviling problem the Council has tackled in eight years of regional power planning. It might change the Council's estimates of how the region should approach its growing energy needs and challenge the Council's fundamental economic assumptions about the region's energy future. Some observers fear that the Council [illegible] its portfolio of energy sources might appear less attractive under greenhouse assumptions.

But even though global warming may pose a matrix of new problems for the Council, it also represents an opportunity, says Ted Hallock, one of Oregon's members on the four-state planning organization. "We're a body that conceivably could influence everybody else. There's not another regional energy planning body like us anywhere else in the country. In the rest of the United States, it's everybody for himself. We have a chance to tell the nation, in choosing what goes into the power mix, that extraordinary attention must be paid to carbon dioxide emissions."

Council Chairman Tom Trulove agrees that the greenhouse effect provides the council with an opportunity. "The solutions to the greenhouse problem are international in scope. They will require unprecedented cooperation by the industrialized and Third World nations to address all sources of the problem, from transportation, to energy production, to deforestation. The United States and the Northwest must provide leadership, and that will likely mean changes in emission standards."

The greenhouse effect should force utility planners to take another look at how they estimate the real social and economic costs of a resource, says Senator Daniel Evans of Washington and former chairman of the Council. "We have done a good job of identifying the full costs of power plants. If I were [on the Council], I'd back off and try to look at whether these environmental costs can be identified and factored into the calculations."

Even though atmospheric scientists agree on the causes of the greenhouse effect, long-range weather predicting remains an inexact science. So, too, does long-range energy forecasting. As a result, pinpointing the implications of the greenhouse effect for energy resources in the Northwest involves as much speculation and guesswork as scientific analysis.

For some scientists, the jury is still

(continued on next page)

The Northwest Power Planning Council

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out on whether global warming has started. Recent warming trends aren't outside of known heating and cooling cycles, they argue. But others are convinced the greenhouse effect is here. James Hansen, chief of NASA's Goddard Institute for Space Studies, told a Congressional committee in June that he was "99 percent" confident global warming has begun.

"We are struggling with not enough knowledge," says Evans. "Words like 'probably' and 'maybe' are being used."

But while politicians and scientists are uncertain about the timing and severity of global warming, the Council must address the issue soon, says Hallock. "I oppose coal-fired generators totally because of their carbon dioxide contribution to the atmosphere. It's a tremendous mistake to produce power for our convenience today and at the same time mess up the atmosphere for future generations."

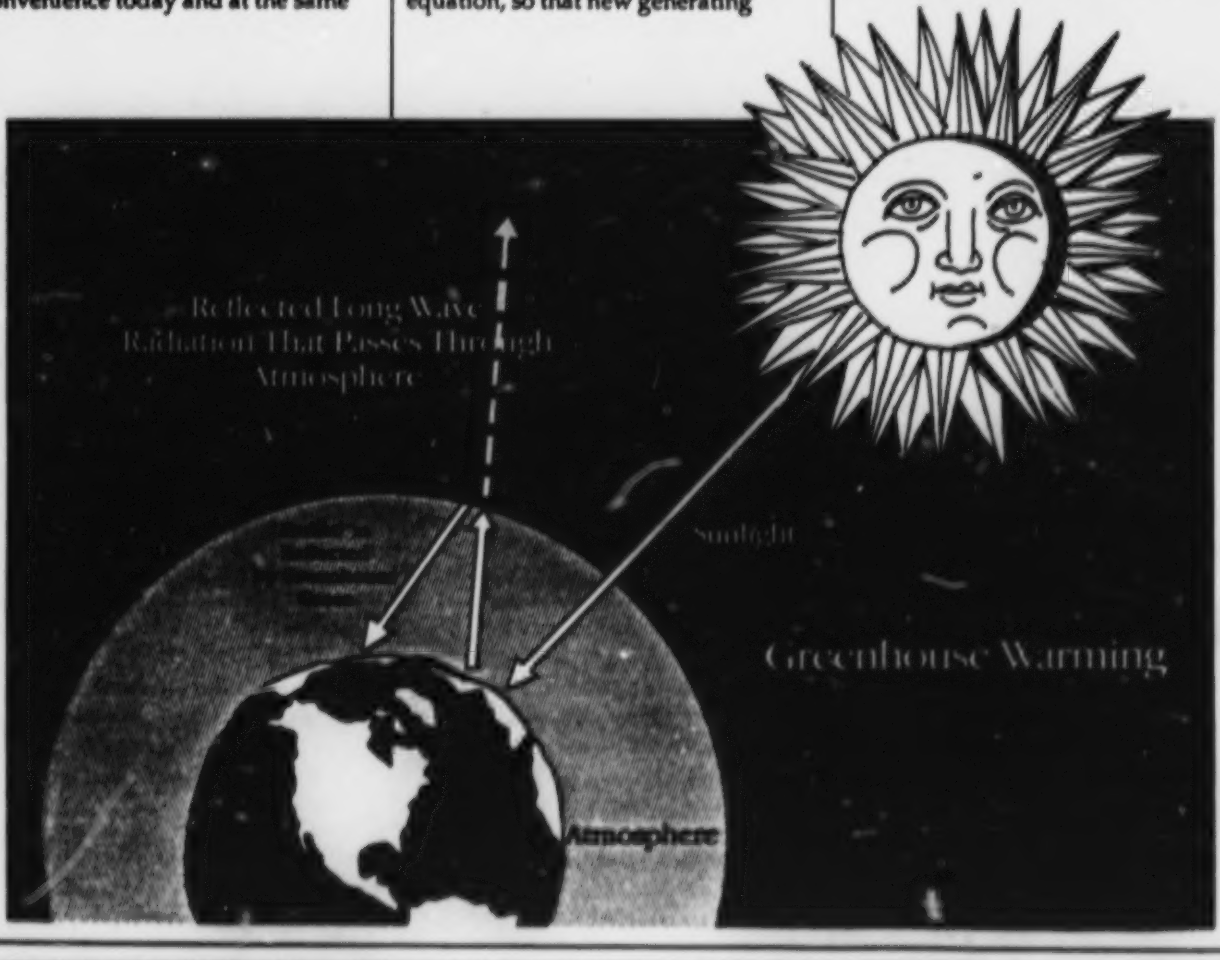
Hallock acknowledges that the Council hasn't taken a position yet. At this point, his statements reflect personal beliefs about the greenhouse effect, not Council policy.

The 1980 Northwest Power Act charged the Council with coming up with long-range electrical energy plans for the region. Those plans try to identify how the Northwest can meet growing energy needs least expensively by envisioning a mix of conservation and generating resources that — depending on the rate of economic growth in the region — will provide electricity at the lowest cost to the region.

However, the greenhouse effect could change the council's traditional least-cost planning calculations, Hallock predicts. Global warming adds a new wrinkle to the planning equation, so that new generating projects will be judged on a least-cost/least-carbon basis, he says. "I don't care about cost-effectiveness or least-cost alone. I've joined the Council to think about tomorrow."

If the rest of the Council takes that approach, gone may be the alternatives that the region turn to coal-fired electric plants or natural gas-fired turbines as ways to generate new power. Gone, too, may be potential resources that the Council hasn't even included in its regional energy plan, such as burning garbage or tapping into pockets of natural gas trapped in underground coal beds.

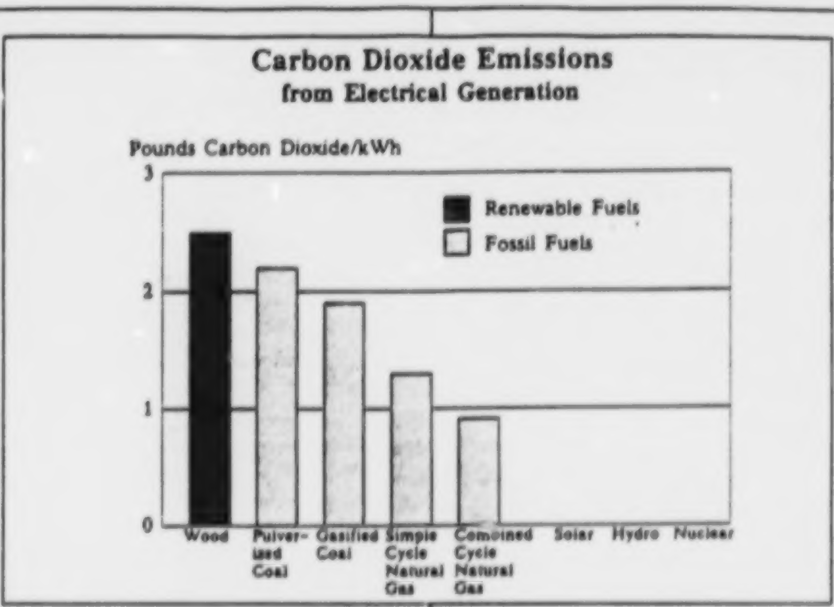
In their place may be an array of alternative resources whose economics looked daunting before they were viewed in light of the costs of avoiding global warming: conservation, nuclear power, geothermal, some congeneration power and even



solar and wind energy.

The region won't be able to avoid making these tough choices for long, because its energy surplus is shrinking. Two years ago, utilities could produce about 2,500 megawatts more power than Northwest customers consumed. That figure may stand below 1,000 megawatts today, and the Council calculates it could disappear as early as 1991. Under high economic growth conditions, the region could require as much as 13,000 average megawatts of power from new resources by the year 2010. That's enough electricity to light 13 cities the size of Seattle.

To further complicate matters, coal and gas-fired units account for 18 percent of the region's 43,360 megawatts of generating capacity today.


Carbon Dioxide Emissions from Electrical Generation

What is the greenhouse effect?

For Biblical scholars, the hardships that could come from the greenhouse effect are nothing new. The floods, pestilence, drought, mass population migrations and famines that many scientists forecast for the 21st century had their first run in the Old Testament.

But what's different this time is that righteousness alone won't get things back on track. Growing numbers of scientists predict that global warming already has started and that actions we take today can only postpone, not prevent, the trend.

To a certain extent, the greenhouse effect is a misnomer. Life on earth wouldn't exist without the atmosphere acting as a solar greenhouse. Gases in the lower atmosphere, particularly carbon dioxide, trap solar radiation as it bounces off the earth, keeping its surface warm. Without solar heat trapped by those gases, earth would be an inhospitably cold place.

That modest greenhouse effect has kept the planet's temperatures relatively stable for thousands of years. But what alarms scientists is the rapid change the atmosphere has experienced during the past 100 years. Since the start of industrialization, when people began to burn fossil fuels in a big way, increasing amounts of carbon dioxide have been pumped into the atmosphere. Those emissions, from factories, automobiles and power plants that run on fossil fuels, have helped increase the concentration of greenhouse gases.

During the same period, worldwide deforestation has cut into nature's ability to handle greater amounts of carbon dioxide. When forests are leveled and the trees left to burn or rot, that not only adds carbon dioxide to the atmosphere, it also reduces the amount of the gas that is converted to oxygen during photosynthesis. The United Nations Food and Agricultural Organization estimates that between 0.6 percent and 1.5 percent of the world's existing tropical rain forests are cleared each year. That's equal to 40,000 square miles, an area roughly the size of Virginia.

In addition, some fossil-fueled processes have by-products that compound the greenhouse effect. Coal combustion, for example, can create acid rain, which — when it falls — defoliates forests, further depleting nature's capacity to reduce carbon dioxide.

Some facts behind global warming are not in dispute. Worldwide atmospheric levels of carbon dioxide have jumped 25 percent since preindustrial times. The earth's temperature has risen nearly 1 degree Fahrenheit during the past 30 years, and it is warmer today than at any time since measurements began 130 years ago. Compared to the 30 years ended in 1980, the world's mean temperature has risen just under 1 degree in the last year and a half alone. The century's four warmest years have been in the 1980s; six out of the 10 warmest years have taken place since 1978. And 1988 is likely to be the warmest yet.

Atmospheric scientists point to high concentrations of several gases as the culprits. Carbon dioxide accounts for about half of the warming, methane for 20 percent, and nitrous oxide, chlorofluorocarbons and lower atmosphere ozone are responsible for the remainder.

Recent computer models, created by the World Resources Institute, suggest that the earth's average temperature eventually will rise from 3 degrees Fahrenheit to 8 degrees Fahrenheit, if greenhouse gases double the preindustrial concentrations of carbon dioxide. Most of the dramatic temperature increases would take place at higher latitudes. Those models, and similar computer projections created by other scientific groups, predict the world's carbon dioxide level is likely to double within 50 to 100 years.

That would be a staggering climate shift. A 5-degree rise would put earth's climate beyond anything in human experience, making it as warm as the dinosaur age, 65 million years ago.

Almost all the earth's climate patterns could shift even if the temperature climb doesn't hit 5 degrees. Rainfall and monsoon patterns would shift. So would ocean currents and growing seasons. Polar ice caps might melt and sea levels could rise as much as three feet over the next 100 years, flooding coastal regions and fouling nearby water tables, according to Jessica Mathews, vice president and research director at the World Resources Institute.

Many atmospheric scientists believe the greenhouse clock already is ticking. Even if all carbon dioxide emissions stopped tomorrow, a global temperature rise from 1 degree to 3 degrees Fahrenheit is inevitable, Mathews calculates. And since the rate of greenhouse gas emissions is accelerating, additional temperature jumps will come faster than in the past. That means speedier changes in climate and less time for societal and ecological adaptation.

But what global warming means for the Northwest remains unclear. Different weather patterns may translate into a dryer or warmer climate in the region. On the other hand, they could mean the Northwest will receive more rainfall than today. Scientists just don't know.

"You won't find any predictions for the Northwest," says Ron Neilson, and Oregon State University atmospheric scientist who's taken a leave to work on long-term global warming research for the Environmental Protection Agency. "All agree on temperature increases for the region, but they disagree on the rainfall implications."

The disagreements come because scientists are unsure what global warming will do to upper atmospheric winds such as the jet stream. The jet stream, a long current of high-speed westerly winds seven to 10 miles above the earth's surface, plays a major role in the Northern Hemisphere's weather patterns. It generally enters North America near the mouth of the Columbia River, and may of the hemisphere's storm tracks follows its meandering path.

The Northwest's rainfall depends on the jet stream. If global warming were to push the jet stream away from the region, precipitation patterns would change. But it's still a puzzle whether warmer temperatures will speed or slow jet stream winds or cause them to depart from their traditional path.

Implications for power planning

The greenhouse effect likely will overturn traditional power planning assumptions. Up until the early 1960s, utility planners judged energy resources primarily on two criteria, price and availability. Thereafter, they began to factor environmental costs into their equations. But the greenhouse effect could put a new wrinkle into their equations, forcing planners to include carbon dioxide and other gases in the cost mix.

Power plants that burn coal, natural gas or oil all produce carbon dioxide and other gases. Cleaning up those emissions will add to the costs of the plants.

On the other hand, hydropower and nuclear plants, which produce no carbon dioxide, are more competitive in a greenhouse scenario. So are conservation and other renewable resources, such as wind, solar, tidal and geothermal power.

But those alternatives aren't risk-free. Nuclear power raises a host of safety and disposal questions. Hydropower might become less reliable if the greenhouse effect makes some regions drier. Warmer weather also may change wind patterns, making wind turbines more difficult to site.

Solar power, too, may prove unreliable if global warming causes more water to evaporate and increases the world's cloud cover.

"There are two immediate questions," says Ed Sheets, the Council's executive director. "Will there be changes in federal regulation regarding carbon dioxide emissions? And could that change the cost or availability of new resources?"

Council vice chairman Jim Goller of Idaho says that those questions should color the Council's agenda. "Looking at the increased greenhouse effect is a proper role for the Council. We need to get the facts before all concerned parties to make an informed decision. The Council should be a player in the international effort."

The Northwest Power Planning Council has factored an array of environmental costs into its planning assumptions. But greenhouse assumptions weren't part of the environmental equation when it drew up its most recent outline of how the region should meet growing power needs over the next 20 years. Under conditions of high economic growth (which the Council feels are unlikely to occur), the region will need to build 12 large coal units by the year 2005, according to the 1986 Power Plan.

Those plants won't be needed if the Council identifies cost-effective alternatives. However, if no alternatives emerge, construction on the first of those plants would have to start in 1995. Under medium-high economic growth conditions, the region would need to power from two new coal plants by 2005.

With its reliance on hydroelectricity, the Northwest is particularly vulnerable to shifts in weather patterns. Some 70 percent of the region's energy comes from hydropower, which means that a drier climate could force the region to rely on other power sources for a larger portion of its load.

Moreover, a drier climate could prompt the region to reduce its estimate of "firm" power, which is the amount of energy that hydropower dams can produce even if there were a repeat of the driest years on record. While the Northwest's dams produce an average 16,400 megawatts of energy today, only 75 percent of that toal is considered firm. That's because utility planners have figured that the system would produce only 12,300 megawatts if the region sees a repeat of the worst known water years.

The greenhouse effect could make those parched years seem lush and force the region to lower the amount of power it could guarantee to customers. That, in turn, would change the region's rate and revenue picture dramatically. Because its delivery can be guaranteed in dry times as well as wet, firm power is more expensive than non-firm power, utilities would have to turn to more expensive resources to make up the difference.

By raising the costs of conventional power sources, the greenhouse effect may give a boost to energy conservation efforts in the region.

Conservation has played a big role since 1980, when Congress passed the Northwest Power Act. That bill treats conservation as the preferred resource for the region, and says it's a wise investment even if it costs 10 percent more than the next most-competitive new resource because of its environmental acceptability.

The Council in the past has figured that conservation measures make economic sense if they cost 5 cents a kilowatt-hour or less. That's what it would cost to build a medium-sized coal-fired thermal plant, the most expensive resource the Council includes in its plan.

But that cost doesn't include measures to deal with carbon dioxide emissions, which may boost the price of a new coal plant to 7.5 cents or 8 cents a kilowatt-hour, notes Marc Sullivan, head of the Northwest Conservation Act Coalition.

In that context, conservation becomes more attractive. "If the 10 percent cost advantage that conservation has been given in the Act were added to these marginal costs, that brings the figure up to 10 cents a kilowatt-hour," he says. "That makes a big difference in the amount of conservation supply."

Jim Litchfield, diriector of the Council's power planning division, agrees that the greenhouse effect may make conservation more appealing. But conservation will take up only part of the slack if the region has to turn to non-fossil fuels, he cautions. "If we tried to meet our high-growth demand without thermal, we'd need to find roughly 10,000 megawatts. Even if we doubled the region's conservation potential to 4,000 megawatts, we'd still have to acquire 6,000 megawatts."

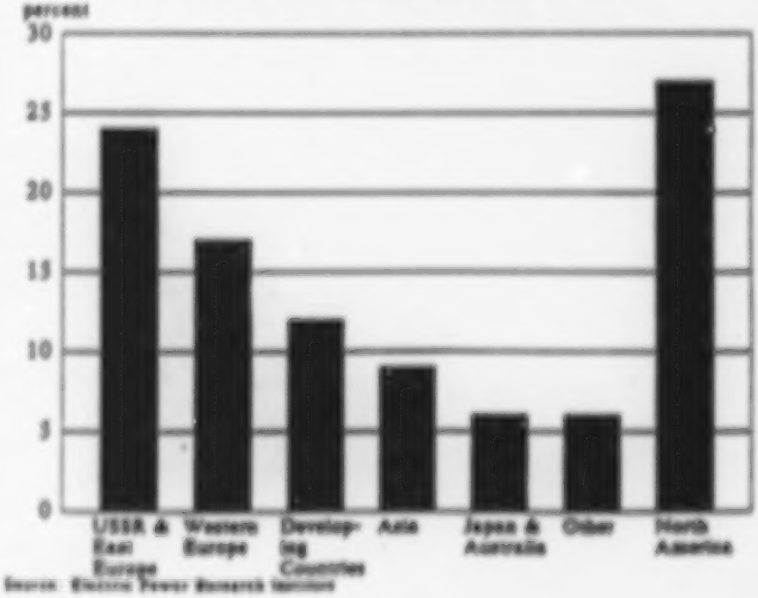
That's as much power as six cities the size of Seattle would consume, and it underscores the challenge facing the Council and other utility planners. If fossil fuels are removed from the energy picture, the region — under certain high-growth conditions — would have to turn to other resources to meet the additional load. Some would be known and tested. Others would be new.

The Council and other utility interests are in a unique position to chart a path through this changing energy environment. But what's different this time is that the route will be characterized by many more unknowns than in the past.

The Northwest Power Planning Council central offices are located at 851 S.W. Sixth Avenue, Suite 1100, Portland, OR 97204. Telephone: (503) 222-5161.

Write to them to get on their mailing list for Northwest Energy News, a free bi-monthly magazine about Council news and activities. And tell them you learned about it through CLEARING.

Global Distribution of Carbon Dioxide Emissions – 1980



Source: Electric Power Research Institute

101 things

YOU CAN DO TO HELP SAVE ANIMALS AND ANIMAL HABITATS

None of us set out to place wild animals on a fast track headed for extinction. In fact, we would save them if we could. Wouldn't we?

We can. At least we can try by reducing our demand for and waste of electricity, petroleum products, metals, land, paper and wood and by becoming aware that when we discard toxic, non-biodegradable wastes, we're only creating pollution that comes back to haunt people and animals alike.

We know you'd be angry if we didn't tell you how you can help while there's still time to make a difference. So here's a list of things we can all do:

In your home...

☐ Recycle everything you can: newspapers, cans, glass, aluminum foil and pans, motor oil, scrap metal etc. In the Portland area, your recyclables get picked up at your curb.

☐ Investigate local recycling centers that take items your garbage hauler doesn't (scrap paper, plastics, appliances, etc.).

☐ Save your kitchen scraps for the compost pile.

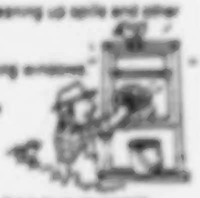
☐ Try to use phosphate-free laundry and dish soaps.

☐ Avoid the use of household pesticides. Flyswatters work very well.

☐ Clean your windows with vinegar and water instead of chemical products.

☐ Use cold water in the washer unless it's necessary to use warm or hot.

☐ Use washable rags, not paper towels, for cleaning up spills and other household chores.



☐ Crumpled-up newspapers are great for washing windows.

☐ Use cloth diapers. The plastic in disposable diapers doesn't break down in landfills.

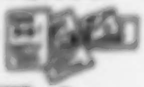
☐ Use cloth, not paper, napkins.

☐ Don't put hazardous substances down your drain or in your trash (paint thinner, furniture polish, etc.). Dispose of them on designated hazardous waste collection days.

☐ Don't use electrical appliances for things you can easily do by hand.

☐ Re-use brown paper bags to line your trash can instead of plastic liners. Re-use bread bags, butter tubs, etc.

☐ Use re-usable containers to store foods...not plastic wraps and foil.



☐ Write to companies that send unwanted junk mail... ask them to take you off their list.

☐ Save your wire hangers and return them to the cleaners.

☐ Take unwanted, re-usable items to a charitable organization or thrift shop.

☐ Don't leave water running needlessly.

☐ Install a water-saving shower head.

☐ Set your water heater at 130 degrees.

☐ Have your water heater insulated free of charge by your utility company.

☐ Turn the heat down and wear a sweater.

☐ Lower your house temperature by one degree per hour for every hour you'll be away or asleep.

☐ Turn the lights off when you're out of the room. Ditto with the TV.

☐ Get a free energy audit from your utility company.

☐ Burn only seasoned wood in your woodstove or fireplace.

In your yard...

☐ Start a compost pile.

☐ Plant shrubs and trees in your backyard that provide food and shelter for birds and other creatures.

☐ Feed the birds.

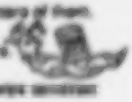
☐ Put up bird houses and baths.

☐ Pull weeds instead of using herbicides.

☐ Learn about natural insect controls as alternatives to pesticides.

☐ Landscape with plants that aren't prone to insect and fungus problems.

☐ Ignore caterpillars and most native leaf chewing insects. Let birds and insect predators take care of them.



☐ Use beer traps for slugs instead of baiting with poisons.

☐ Use organic fertilizers...good ol' manure or zoo doo helps condition your soil and fertilizes at the same time.

☐ If you use pesticides, herbicides or fungicides, don't throw leftovers in trash, down your drain or into a storm sewer. Dispose of them on a hazardous waste collection day.

☐ Compost your leaves and yard debris or take them to a yard debris recycler. Burning them creates air pollution and putting them out with the trash is a waste of landfill space.

☐ Use mulch to conserve water in your garden.

☐ Plant things that don't require as much water.

☐ Take extra plastic and rubber pots back to the nursery.

☐ Large expanses of lawn are not good habitat for other creatures, plus they usually must be maintained with chemicals and extensive watering. Dig up some of your grass and plant native shrubs or trees instead.

☐ Plant short, dense shrubs close to your home's foundation to help insulate against cold.

On vacation...

☐ Turn down the heat and turn off the water heater before you go.

☐ Carry re-usable cups, dishes and flatware.

☐ Make sure your plastic trash doesn't end up in the ocean.

☐ Don't pick flowers or collect wild creatures for pets... leave animals and plants where you find them.

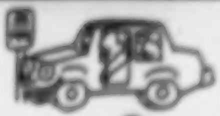
☐ Don't buy souvenirs made from wild animals.

☐ Watch out for wildlife...give consideration to all living things you see crossing the road.

In your car...

☐ Drive sensibly...don't waste gas

☐ Keep your car tuned up



☐ Carpool. (Call 227-7665 for information)

☐ Use public transit

☐ Ride your bike or walk instead

☐ Buy a more gas efficient car

☐ Recycle your engine oil

☐ Keep your tires properly inflated to save gas

☐ Recycle your old tires

☐ Keep your wheels in alignment to save your tires

☐ Don't litter

At your business...

☐ Start an office recycling program for office and computer paper, cardboard, etc.

☐ Use scrap paper for informal notes to yourself and others.

☐ Print things on recycled paper.

☐ Print or copy on both sides of the paper.

☐ Use smaller paper for smaller memos.

☐ Re-use manila envelopes and file folders.

☐ Hide the throw-away cups and train people to bring their mugs to meetings.

☐ Route things around the office or post non-urgent communications rather than making multiple copies.

☐ Use the stairs instead of the elevator.

☐ Office building landscape doesn't have to be sterile lawns and bedding plants. Plant trees and shrubs the birds will like.

☐ Put a bird feeder outside your office window. It's a great conversation piece.

When you're shopping...

☐ Don't buy food or household products in plastic or styrofoam containers if there's an alternative (e.g. and egg cartons, vegetable oils, butter tubs, etc.) They can't be recycled and they don't break down in the environment.

☐ Don't buy "disposable" anything. Paper plates and towels, styrofoam cups, etc. are extravagant wastes of the world's resources.

☐ If you must buy disposables, buy paper products rather than plastics, rather than styrofoam. The manufacture of styrofoam depletes the ozone layer.

☐ Buy durable products and keep them a little longer. Cheap furniture, clothes and appliances often have short life spans.

☐ Check the energy rating on major appliances you buy.

☐ Read labels and buy the least toxic product available for cleaning, pest control and other jobs.

☐ Put your parcels into one big sack instead of collecting several small ones.

☐ Don't buy things with excess packaging (individually wrapped cheese slices, apples on a paper tray wrapped with cellophane, etc.)

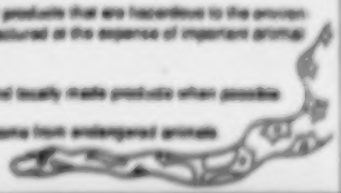
☐ Buy in bulk: reduce pollution that comes from the manufacture and disposal of many small packages.

☐ Ask questions...don't buy products that are hazardous to the environment or that were manufactured at the expense of important animal habitat.

☐ Buy locally grown food and locally made products when possible.

☐ Don't buy products that come from endangered animals.

☐ Don't keep "exotic pets".



Personal efforts...

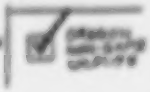
☐ Join a conservation organization.

☐ Volunteer your time to conservation projects.

☐ Give money to worthy conservation environmental causes.

☐ Check your lifestyle...think about the effects of your daily actions on the environment.

☐ Take advantage of the Non-game Wildlife check-off on your Oregon tax form.



☐ Vote for candidates that share your sentiments.

☐ Read books and articles on wildlife and environmental issues.

☐ Watch nature programs on TV.

☐ Subscribe to conservation or environmental publications. Purchase them as gifts for others.

Spread the word...

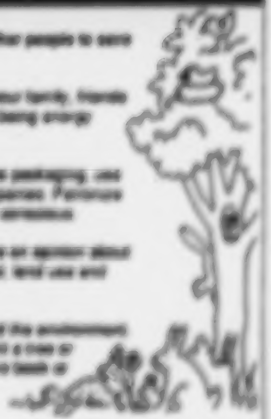
☐ Convert by example...encourage other people to save resources, too.

☐ Tease, cajole, persuade or shame your family, friends and neighbors for not recycling, not being energy conscious, etc.

☐ Complain to merchants about excess packaging, use of plastics, etc. Write letters to companies. Patronize merchants who are environmentally conscious.

☐ Write your legislators when you have an opinion about pending legislation on environmental, land use and other issues.

☐ Teach children to respect nature and the environment. Take them on a hike, help them plant a tree or build a bird house. Buy them a nature book or subscription to a wildlife magazine.



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CLEARING
environmental education in the pacific northwest

Connecting People and Planets

Clifford Knapp

Some visionaries have noted that humankind is integrally connected to the universe. This recognition is critical to our survival on earth. The purposes of the article are to illustrate some of the connections that people have with the planet and to challenge outdoor-environmental educators to promote this concept in their programs. The "connections" theme is developed through examples from the past and present. The point is made that we must be equally concerned with the human element as well as the non-human aspects of nature. The challenge set forth to educators is to comprehend the key connections that exist among people, rocks, trees, wildlife, and other earth entities and to develop more effective programs that educate their clientele.

In his book, The Proper Study of Mankind, Stuart Chase (1948, p. 305) poses two great questions: "How shall we come to terms with nature?" and "How shall we come to terms with our own kind?" Part of the answers to these questions hinges upon a recognition that humans and the rest of nature are integrally connected.

Life is full of connections - although we are not always aware of them. Becoming more aware of life involves discovering some of these connections. Fritz Perls, founder of Gestalt Therapy, said that "awareness... - by and of itself - can be curative." (Walsh, 1984, p. 103). Perhaps he meant that becoming aware of our world cures apathy and ignorance. When we find awareness suddenly, we call this insight an "aha" experience and when we find it slowly we call it wisdom. Haiku, a Japanese poetic form, is defined as a "record of a moment of emotion in which human nature is somehow linked to all nature." (Henderson, 1967, p. 22).

The connections that people make reveal who they are and what is important to them. Ants are connected to aphids when they extract a sweet liquid from them or carry them to shelter. Rocks are connected to glaciers when they have been moved or worn smooth by them. A wool sweater is connected to sheep when their wool has been used to make it. You are connected to me as you receive these words and encode them into personal meanings.

Marilyn Ferguson, author of The Aquarian Conspiracy, (1980), believes in a "small world phenomenon" that states we are just five first-name acquaintances or closer away from everybody else. She believes that if we hand a letter addressed to a bishop in Massachusetts to a person in Iowa, that the Midwesterner can find an acquaintance who can send the letter to another acquaintance, and so on, and finally reach the bishop without involving more than five people who know each other.

Sometimes, we can better understand our connections with the earth by taking a short journey in our minds. The following guided imagery is adapted from an activity titled, "Water Wings", developed by Project WILD (WREEC, 1986), a successful supplementary environmental education curriculum. "Water Wings" is part of a series of new aquatic lessons designed to give students a sense of their connection with the world's oceans. All of the seas on earth are connected and in some way, all the fresh water is linked to the oceans. Consider the molecules in air that surround us; they connect us to the waters of the world. Get comfortable and relax. Take a few deep breaths, and take a journey around our water planet:

You are sitting on the edge of a stream... your bare feet are swinging in the clear, clear water. The water feels good, and it's the right temperature. You feel the *current washing over your feet, pulling at them. Think about the water flowing past your feet until it reaches a larger body of water. The water connects you with it. Feel its more powerful flow. See the green ribbon of trees and plant life on the banks. The larger waterway carried the water past flat farmlands, past cities, factories, and forests eventually reaching the sea. Through your feet and the continuous currents of water you can feel the sea. Now stretch your mind and realize that you interconnect with all the world's oceans. You are now touching one single body of water that stretches all around the world. Your touch laps against the shores of the Pacific Ocean, it flows under the Golden Gate bridge, it laps and plunges around oil drilling platforms in the North Atlantic as a storm rages dark and gray. A native Indian shivers on the Arctic shores before her parka begins to warm her. A Greek fisherman's son in a warm Mediterranean Sea tugs fiercely on the fishing nets. Water connects your feet with every stream flowing into the oceans around the world. You can reach up the rivers to the hearts of continents -- you can feel the tremor of the hippopotamus which just dove into an African river. You feel an alligator silently sliding toward a heron in the Florida everglades. You feel beavers busily building a dam on a stream in Europe. Your reach embraces all the whales, all the porpoises, all the sharks. You are connected with the mythic creatures, living only in the minds of people in the past -- mermaids, citizens of Atlantis, and the monsters that swim in Loch Ness. Your feet feel the flow of the current of the miles-wide Amazon River in South American, the ancient Nile River pushing north through Africa, the Colorado River thundering with a boatful of river rafters through the Grand Canyon. Your watery embrace wraps all around the Earth. And, of course, the water flowing over your feet connects you with everyone else who is now sitting with feet dangling in a stream, wondering where the water goes... It's time to come back. Bring the limits of your senses back from the world's rivers and oceans... back to the surfaces of your feet... back to where you are.*

> Our educational system has divided knowledge up into different subject areas that we usually learn one at a time. Although splitting them has some benefits, it also creates serious problems. When we separate the interrelated parts of our planet, we often fail to understand the connections among them.

Now that you have returned from your mental survey of the oceans of the world, consider how we tend to forget about our unity with each other and the planet. Sometimes we use language to separate us from our environment. We tend to divide things on the planet by creating different word categories. The people who do this could be called the "splitters." They set off people from nature, night from day, indoors from outdoors, good from bad, and natural science from social science, to mention only a few. In reality these entities are never completely separated from each other. Our educational system has divided knowledge up into different subject areas that we usually learn one at a time. Although splitting them has some benefits, it also creates serious problems. When we separate the interrelated parts of our planet, we often fail to understand the connections among them. We could label the people who perceive these connections as "lumpers." The outdoors is especially suited to helping us understand the wholeness of knowledge and the interconnections among the components of our environment.

The word "connect" is intriguing. It comes from Latin "to bind." The word is also related to the Latin word "nodus" or knot. *The Aquarian Conspiracy* by Marilyn Ferguson (1980) describes many connections. The word conspire is derived from the Latin "to breathe together." Ferguson calls our attention to the need for a new guiding pattern of thinking. The title of the book simple means "a plotting together to make our modern-day world work."

Knowledge that is learned separately is often interconnected in reality. Over the years, my interests have spanned Native American philosophy, nature, and science, psychology, values, and group dynamics. The links among these topics are now clearer. Some Native Americans view animals such as deer, beaver, and skunks as people. They also believe that there is a mind-inside-the-skull as well as a mind outside in nature. Some people believe in what is called the Gaia hypothesis, which speculates that the earth is a living organism that carries on many of the same functions as an animal or plant. Human intelligence is many-faceted, not one thing to be measured with a single test. Howard Gardner, author of *Frames of Mind* (1983), believes that we have at least seven different intelligences and that the ways we now use to determine a person's IQ are severely limited. We know a lot more about group dynamics, human relations, and how people change than we are now applying. Most people prefer to learn in different ways and therefore, we as teachers, need to vary our teaching styles to accommodate them. People also have different personality types, and because of this, they see the world through different lenses. All of these apparently separate pieces of information now seem more connected to me. One of my goals has been to help people see more connections between nature and human nature through outdoor leadership. Perhaps such a person can be described as a global therapist.

Outdoor environmental educators have long heard and read that they need to teach about ecological connections. These relationships extend to the total world and beyond the planet - not just to the rocks, trees, and wildlife. This message has been repeated in many ways over the last century. Theodore Roszak stated in his book, *Person/Planet* (1978) "that the needs of the planet are the needs of the person. Therefore, the rights of the person are the rights of the planet."

John Muir said, "When we try to pick out anything by itself, we find it hitched to everything in the universe." Albert Schweitzer challenged man, "...to think about the mystery of his life and the links which connect him with life that fills the world..." (Van Matre and Weiler, 1983, p. 133).

Hyemeyohsts Storm, writing *Seven Arrows* (1972, p. 5) believed that "the universe is a mirror of the people, each person is a mirror to every other person" ... "The tiniest flower can be such a mirror, as can a wolf, a story, a touch, a religion or a mountain top." Barry Commoner wrote the first law of ecology: "Everything is connected to everything else" (1972, p.33). Sun Bear and Wabun, modern-day writers, sum it all up when they wrote, "We have forgotten that we are connected to all of our relations in earth, not just our human family. We have forgotten that we have responsibilities to all of these relations, just as we have them to our human families." (1980, p.6)

A Zen master claimed that our true nature is an aspect of a universal consciousness. We are more than our body and mind. The universe is not outside of ourselves. The mountains, the sea, and the stars are part of your body and we are connected to all life. If we truly believe this, then problems with other people and nature are not only "out there," they are also "in here" within us. We would not pollute the environment to the degree we do because we would know we are polluting ourselves. We would not treat ourselves and others unkindly because we would know that we are abusing the environment.

Our growing technology has worked both for and against our connections with the planet. On one hand, we now have the technology to explore with microscopes, binoculars, satellites, and telescopes. We possess more power to manipulate living things through genetic research and alter other natural cycles. We also have more tools to explore the inner universe of our mind and body.

When we fertilize crops, apply pesticides and herbicides, seed clouds to make rain fall, build water treatment and sewage plants, process foods, raise plants and animals for food, manufacture new products, and invent medicines to cure disease, we are entering into natural cycles with the intent of helping humanity. Sometimes our impact has been judged negative and sometimes it has been judged positive. There is a lot of debate about whether we should continue to influence these cycles or whether we should return to a simpler lifestyle and leave them alone.

> ...[T]echnology has broken many of our connections with the planet. As we build homes and regulate air temperature and humidity, we cut ourselves off from the outdoors. As we increase the hours in front of a computer, "boom box," television, video games, or other machines, we reduce the time that we can explore nature with our senses.

On the other hand, technology has broken many of our connections with the planet. As we build homes and other buildings and regulate air temperature and humidity, we cut ourselves off from the outdoors. As we increase the hours in front of a computer, "boom box," television, video games, or other machines, we reduce the time that we can explore nature with our senses. According to Carl Jung (1964, p. 95) we are gradually becoming separated from our "unconscious identity" with natural phenomena. Nature is losing its symbolic function in our lives. For most people, thunder is no longer the voice of an angry god, rivers no longer possess a spirit, and mountains no longer speak to us nor do we speak to them. As our symbolic connections with nature die, so does our emotional energy for living. Jung believed that we can only meet the demands of life when we are in harmony with ourselves, and we can only adapt to our inner world when we have adapted to environmental conditions.

In many cases the products of science have been used to attempt to dominate and tame nature. Science is a methodology — a way of seeking answers to certain questions. It is not a total world view. Science cannot deal with the most important questions in life such as: Who am I? What is most important to me? Where should I be going? and Should we care for the ecosystems on this planet and beyond? If we cause the earth or the individual forms of life on it to die, we diminish ourselves to that extent. If we don't treat the planet and its living things with respect, we are not caring for ourselves.

On a recent flight from Denver to Chicago, a violent thunder storm closed O'Hare airport and diverted us to Detroit until the storm passed. The pilot's voice over the speaker blamed "Mother Nature" for the delay and nature became the villain in the eyes of many passengers. People's schedules had to be rearranged and some were annoyed at the inconvenience. Almost everyone was thinking in terms of their own human time frames and not considering the water cycle which was essential to their survival. They were suddenly awakened to the fact that certain parts of nature were beyond their control and that we had to adjust to the planet's life-sustaining systems. Technology can only mask our awareness of nature for a limited time.

One of my favorite books is titled, *The Other Way to Listen* by Byrd Baylor (1978). It is the story of how an old man teaches a young boy to take time to listen to nature.

[the old man]... told me how a friend of his once heard a whole sky full of stars when she was seven. And later on when she was eighty three she heard a cactus blooming in the dark. At first she didn't know what she was hearing. She found it by just following the sound. There were twenty flowers on one cactus and they were all white as the moon. The old man said, "Most people never hear those things at all." I said "I wonder why?" He said, "They just don't take the time you need for something that important." I said, "I'll take time. But first you have to teach me." "I'd like to if I could" he said, "but the thing is... you have to learn it from the hills and ants and lizards and weeds and things like that. They do the teaching around here." "Just give me a clue how to start," I said. And so he said, "Do this: go get to know one thing as well as you can."

When is the last time you took the time to view a sunset, watch a bird build a nest, observe a spider wrap its prey in silk, watch a dew drop evaporate in the sunshine, or sleep out under the stars? As society we have allowed science and technology to break some of our connections with nature more than we have used them to connect us. Technology has the potential to increase our awareness of our world, but some of us have used it to blind ourselves. Perhaps we need to learn a lesson from the societal scientists who help young people to distinguish between good touch and bad touch. In the same way, we might divide our impact on nature into good tech and bad tech and choose more of the former.

A new word that isn't in the dictionary yet is "bioregionalism." A new movement indicates that we are becoming more aware of the connections between people and places. A bioregion or "life territory" is a geographical area in which the boundaries are set by nature - flora, fauna, water, climate, rocks, soils, landforms, and the human culture which results from the interaction of these elements. It is not only a physical region, but it is a psychological identification with a place. People are organizing informal institutions to initiate change within a bioregion. The origin of this term has been traced to a Canadian poet and biogeographer, Allen van Newkirk, who coined it in 1975. The idea of viewing problems from a regional perspective was the primary way that early humans dealt with their survival as hunters-gatherers.

> Imagine, if we all had the kind of education which helps us put things together as well as take them apart. Our programs would teach us the connections between the earth, sky, and people of a particular place by putting us into direct contact with them.

An example of a bioregional approach to an environmental issue is occurring at the border of Canada and the United States where the province of New Brunswick and Maine meet along the St. John River. There the ground water on both sides of the border is contaminated by agricultural chemicals which are linked to a high incidence of natural birth defects. High levels of nitrates, mostly from fertilizers, can form cancer-causing substances which create these problems. Scientists are also finding traces of pesticides in the water which are sprayed on the potato crops to control the Colorado potato beetle. They can detect nitrates and pesticides in the water, but they don't know for sure what effects these chemicals will have on the human body. Despite the common problems shared by the two nations, the U.S. and Canada have not yet fully cooperated to solve it from a bioregional perspective.

Another important word that is not in the dictionary is "eco-justice." Eco-justice means doing justice to the whole creation (Engle, 1986, p. 3). The term is a combination of the concepts of ecological wholeness and social justice. Eco-justice extends the idea of justice to the earth as well as its people. Eco-justice describes the application of a global philosophy. Every effort to achieve economic, racial, political, and gender justice involves solving the problems of the earth's resources. Every effort to protect the natural systems involves social development. Neither goal can be achieved without the others.

Ancient and modern religions have advanced the idea of "nature" and society as a wholistic kingdom. The root meaning of the term religion is a "binding together." Religious rituals symbolize information and feelings about relationships. Genesis 9:9 described God's covenant with the people and the land in this: "Behold I establish my covenant with you and your descendants after you, and with every living creature that is with you..." The English reformers of the 18th century saw the world as one vast fellowship of life and spoke on behalf of the rights of all oppressed - animals, slaves, the poor, and women. Today, Thomas Berry, director of the Riverdale Center for Religious Research in New York, calls himself a "geologian" rather than a theologian. He is primarily concerned with our relationship to our planet and all of its living and non-living resources.

Dolores La Chapelle (1978) uses a metaphor to express the importance of establishing a relationship with all the beings in a community. She describes how a peach requires the leaves of the tree to provide it with the sun's energy through photosynthesis, the trunk of the tree to hold the branches high in the sky to reach the sun which ripens it, the rain to provide the water it needs, the minerals from the soil brought to the peach by the root hairs and rootlets and the soil to provide the support for the tree (p. 118). All of these components of the community are necessary to bring a peach to maturity. If the peach is picked green for shipping it never tastes the same as a tree-ripened one. We, like a peach, need to ripen and reach maturity by staying connected to what nurtures us.

Imagine, if we all had the kind of education which helps us put things together as well as take them apart. Our programs would teach us the connections between the earth, sky, and people of a particular place by putting us into direct contact with them. We would have an education that teaches people how to feel a sense of personal power and to have ideas about how to care for themselves, others, and the planet.

Developing more effective educational programs to teach about our connections with all of nature is essential if we are to survive on this planet. Let it not be said that humankind was not able to answer Stuart Chase's two great questions. We must and we will.

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L EDUCATION

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Environmental Education

in the Pacific Northwest

Acid Rain/Acid Snow Studies in North Pole

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Environmental Education
in the Pacific Northwest

annually. Other possible sources include local automobile exhaust and industrial pollution from Europe and the Soviet Union. These regions are blamed for a pollution phenomena known as "Arctic Haze" which is a layer of polluted air hanging over the arctic region. We will be attempting to trace the sources of this pollution in future projects.

In 1985 the local wisdom dismissed concern for pollution from our refineries "since it only drifts out over the tundra anyway." Today, due in part to student and parent awareness, there is a more active interest in the pollution source problem and we are proceeding very slowly and carefully, trying to consider all the variables. Since no statewide precipitation/acidity data exists we are attempting to enlist all schools to gather records using standardized collection techniques and equipment and to report to a network. There are two types of acid snow collection methods. The first is similar to the collection of rain for acid rain testing. A collection jar well rinsed in neutral deionized water should be used. The snow is then collected during a snowfall, preferably set out at the beginning and retrieved after the end. The jar is capped and the snow allowed to melt. It is then tested with pH paper and the results recorded as well as date and times of the fall. This is repeated for each snowfall. This method is difficult for students because snow falls when it will. The second method is to take a snow core sample on a set date once a month. The sample is processed using the same methods as the above snow sample. This results in a systematic record and changes in acidity can be extrapolated. This method, while much easier to complete, yields a core which may also be cumulatively contaminated by cars. We would appreciate receiving copies of any school's data if they would send it. Perhaps we could have a data exchange for the Pacific Northwest.

We find a lot to do outdoors and indoors with ice and snow, trying to answer such questions as "Can fish see through ice?," and "is it really coldest just before dawn?" Our activities are designed to take 2 or 3 class periods to complete. Over the years we have developed many projects, thus each class of students has many opportunities to learn and the curriculum for science class varies year to year. These "hands-on/minds-on" activities begin with a guided discovery approach to learning which I find works very well with middle school students. A list of these activities to spark young minds includes: snowmobile impact study, animal tracking, snow shelter building, winter survival, animal/plant arctic adaptations, insulation lab, fold-a-snowflake lab, mini iceberg lab, creeping glacier lab, avalanche lab, winter plant identification, will a moose eat this tree lab, snow profiles, snow physics, snowflake casting, and prescription for snowflakes.

Teaching in the snows of Alaska is something special. Like snowflakes, none of my 25 years of teaching have been exactly alike. My approach to teaching science has been the same for other subjects I have taught. I think variety in learning opportunities that require the student's creativity while demanding their intelligence and dedication enhances their learning experience. For the early adolescent I think there are overwhelming advantages to using an educational approach which stresses intense participation in real world science, a thorough understanding of scientific concepts, direct involvement with guest speakers who present their ongoing research as it is relevant to classroom projects, and a guided discovery teaching style.

For additional information about Snow Survey or the Acid Rain/Acid Snow Network, write:

Mrs. Gerry Young
North Pole Middle School
300 8th Avenue
North Pole, Alaska 99705

Balancing the snow core tube to measure snow density. Photos by Ann Rippy, Soil Conservation Service, USDA

"A SAND COUNTY ALMANAC"--- REVISITED

Some thoughts on our times

By Mike Spranger, Program Leader, Washington Sea Grant Marine Advisory Services.

"There are some who can live without wild things, and some who cannot. Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild and free. For us in the minority, ...the chance to find a pasque-flower is a right as inalienable as free speech."

Aldo Leopold

Forty years ago the conservationist Aldo Leopold wrote his classic, *A Sand County Almanac.* Rereading it recently, I was struck by the simple, yet profound message Leopold left for us - a message as pertinent today as it was then.

Leopold said that mankind needs to develop a "land ethic" which recognizes the interrelationship of our land, water, and air resources. Leopold's ethic changes the role of man from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow members, and also respect for the community as such." He says that in order to live in harmony with the environment, we must develop an individual and community responsibility to ensure its continued health.

A relatively simple philosophy, yet we still have trouble remembering the cardinal rule--that "everything is connected to everything else." The environmental consciousness that was awakened in the late 1960s and 1970s has been set aside in the 1980's. We have developed a kind of environmental amnesia to buffer us as we strive for economic success. But past actions and indifferent attitudes are catching up with us. We are relearning a painful lesson: we cannot set ourselves apart from the natural world that sustains us.

To continue on our present course would ensure our own destruction. Many scientists feel that the world's life-support system is breaking down because of carbon-dioxide overloads, chlorofluorocarbon (CFC) residues and forest destruction. Leopold's advice for a land ethic is now needed on a global scale.

We now know firsthand that deforestation in Nepal results in devastating floods in Bangladesh; that the manufacture of CFCs in Japan can influence skin cancer rates in Argentina and may affect the basic food chain in our oceans--due to the destruction of our protective ozone layer; and that using the ocean to dump our garbage threatens marine life and makes our beaches unfit for our use.

Knowing this, we must do more than feel remorse. WE MUST ACT. To develop an ethic of conserving, managing, and utilizing our natural resources as a way of life, we must live an ethic that considers the long-term, as well as the short-term, the biologic as well as the economic, and we must put this ethic into action.

It is encouraging that recent international treaties call for a reduction of CFC production and a ban on dumping of plastics at sea. Radioactive, chemical, and domestic waste disposal is being reexamined from local, regional, and national perspectives. In the Pacific Northwest agreements have been reached among timber, fish, and wildlife interests; positive steps are being taken to clean up Puget Sound; and recycling is underway in several major cities.

Locally, individuals are realizing that our small streams are part of a larger ecological picture. People are rediscovering that upland actions affect streams, and that streams affect the bodies of water into which they flow. Individuals and groups are "adopting streams" in order to improve and rehabilitate them so that the waters can once again sustain the diverse lives they once held.

Leopold's land ethic stressed "conviction of individual responsibility for the health of the land." Today, an increasing number of people are incorporating this land ethic into their daily lives, and using this ethic to influence decisions that have local, national, and international impacts.

All of us need to develop such an ethic. In light of the environmental problems that are now emerging--our future depends on it.

Chief Seattle's Statement on Ecology

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An Environmental Education Tool...

The Creative Journal

**By Phil Hammond
Lee County School District
Fort Myers, Florida**

There are few naturalists that do not use a journal as a working tool. Darwin, Thoreau, Burroughs, Muir, Audubon, Teale, and Carson all used the journal to gather their observations and insights into the nature of the universe.

In today's environmental education programs the creative journal can be a very powerful instructional tool. So many of our students are conditioned to either passive participation and being entertained or to being "hyper" participants that rarely have the guided opportunity to become a careful observer, who can reflectively access or communicate what they feel, value or believe about how the natural world works.

In environmental education students need an opportunity to slow down and "see," "feel," and "know" what they are experiencing. They blossom when given opportunities to draw, paint, paste in, write or otherwise collect and access what they feel and know about what they are experiencing. Journaling provides a chance for participants to dig in below the surface barrier to explore their inner values and beliefs. By balancing writing and imaging they engage all brain modes of operation. By learning to draw they must learn to see. As "seeing" improves so do drawing skills grow and students are further empowered.

Just as humans co-evolved with tools, creative journals are a powerful tool to support people engaging in environmental education programs.

Some people prefer to keep a diary, others a field notebook of observations and some a creative journal. All have value. Getting started... then tending to the birth and the experience on a regular basis are the elements of a successful experience. The accompanying article gives some insight to a rationale and process for making journaling a regular component of your environmental education experience. When you're away from your journal for awhile and it "calls" you... you'll know that you have bonded the tool with your creative self and your reflective needs. Best wishes as you explore the environment out there and transfer nature from experience to your biological system to your journal page.

Strange as it may seem in this era of high technology, the use of a personal journal is re-emerging as one of the most powerful of today's tools. It speaks to the need for "high touch" — and is available to help support an expanding quest for personal as well as organizational and corporate creativity.

The type of journal that is being rediscovered by so many people is not generally a diary — which is a different type of potentially powerful personal history, and often a therapeutic tool — but rather a creative tool. Today's journal is one that, by its format and nature, serves as a resting place for creative insights and ideas. It is a journal that becomes a place and a medium to serve as a mental and physical playground full of images and text. It connects the journalist to the nature of life on the planet. It provides a context for exploring patterns and functional ideas in progress. Virtually every system for creative thinking requires some type of idea-catching system. However, the type of creative journal I describe is far more than just a book for catching the "aha" of the moment. It becomes a place to generate, expand, explore and document ideas and mental excursions — while they are in

program.

"How do you get started? Do you work in your journal every day?" These are usually the first questions asked by folks toying with the idea of joining the journal journey.

For me, early attempts at diaries or logs on camping trips and, later, field research journals and notebooks, were a beginning -- but they were a rather spasmodic endeavor. Then, friend and mentor Bob Samples introduced me to the concept of keeping a "creative journal" in order to better catch our ideas in play and progress. Bob develops many of his books from the ideas and insights first explored in the pages of his journals. Later, Ned Herrmann, then Director of Training for General Electric and now President of Applied Creative Services, asked me to develop a session on journal keeping as part of his week-long Applied Creative Thinking Seminar program. Since then I have introduced thousands of people -- ages three to 90 -- to creative journal keeping. These are students, parents, educators, corporate executives, friends, and grandchildren who are now experiencing the pleasures of growth that flow from the sense of satisfaction and accomplishment derived from seeing one's own insights, creativity, and wisdom captured on a journal page of image and text.

All it takes to get started is a book with lined, unlined, or graph pages -- whatever best suits you. You also need some inexpensive tools for writing, drawing, coloring, painting, cutting and pasting. A glue stick is terrific! Clear plastic adhesive (cut to your journal's page size) is useful for sealing things like leaves or items for collages into your journal's pages. You also need a commitment to work on analyzing, imaging, reflecting, risking, and synthesizing.

I find it helpful for each of us to establish our own rules for journal keeping. To establish rules, you must think through your purposes for keeping a creative journal. For me, the purposes for keeping a journal are to enhance my creative insights, to get below the surface of seeing things in life, to reflect on the wisdom of nature and to improve my ability to recognize and express my feelings and intuitions about things I value. I want to improve my flexibility and fluency in thinking and expressing ideas. To accomplish this, I make rules for my journal keeping such as: I can't use the same medium -- for example, a pen -- to write for more than three consecutive pages in the journal. When we change the medium, color, and layout, we tend to change the ways in which we think. This is a way to encourage our own flexibility -- a necessary ingredient for creativity.

In order to stay fluent -- as well as anxious to produce volumes of completed pages in my journal -- I impress myself on each journal much as a hatchling sea turtle does to a specific beach, a bird or a child to its parents, or a salmon to its hatching stream. This technique is simple but powerful, in that it begins each journal in a unique way. My imprinting occurs on the first two pages.

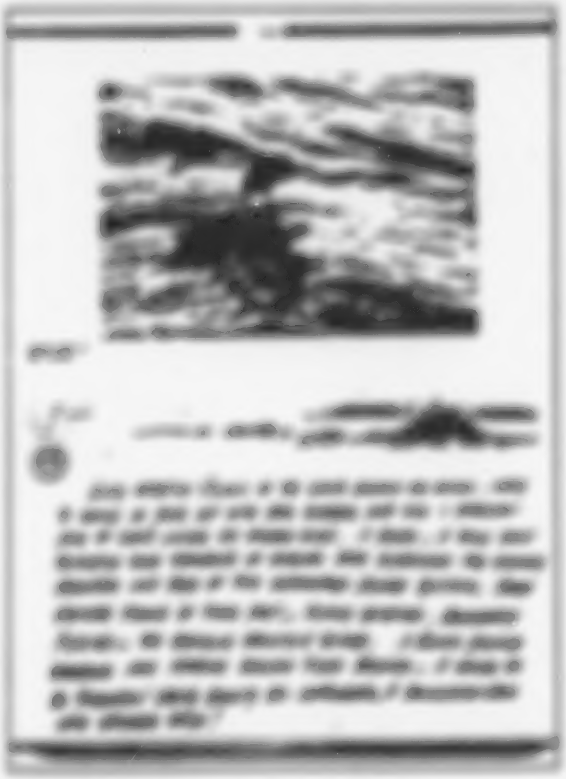
When beginning a new journal, I sit quietly and absorb my location. On the left page, I create a color image in some fashion. The image may be abstract or realistic. It is something specific about the time and place -- and reflects some insights that flow from the nature around me. I may begin in the mountains, at a beach, in the city, or in my yard at home -- it can be anywhere outside that takes on a special meaning to me.

On the right-hand page, I write in a stream of consciousness mode. I record what flows from my mind at that time and place.

The journal then becomes the journal of that place or time. Somehow this bonding process with a journal — especially if reinforced by rapidly generating the first dozen pages or so of new ideas, information, and reflections — tends to develop a connection and commitment to the journal that stimulates even those with more apathetic and procrastinating tendencies. Each person should develop his or her own style and pattern for frequency of journal use. For some it may be an almost daily endeavor. For others, it is an effort that takes periods of intense journal productivity, followed by journal ambivalence or even hibernations. In any case, if you have effectively imprinted and worked on the first 10 pages or so of your journal, it is difficult not to return to it. It has its own way of calling you.

It is that first ten pages or so of the journal that most people have a difficult time creating. The threat of the blank page is sometimes overwhelming, as is an ego compulsion that every page must be a masterpiece. Through the process of offering journal workshops, I have compiled more than 110 "starters" for journal assignments. Some are as simple as outlining an object such as coins from your purse or pocket — or tracing a carefully selected leaf and then writing your insights either inside or outside the outline patterns. A favorite of many people is one dubbed the "daily double." Select a place, object, or event to carefully observe. Label the right page of a page pair, "observations." Label the left page, "reflections." On the observations page, record all the pertinent observations in the best scientific style that you can muster. Describe context, physical characteristics, time sequences, interactions, temperature, air flow, quantifiable points of interest — details, details, details!

On the reflections page, record your inner perceptions, insights, and feelings — as well as your sense of connection or distance from the place, object, or event. In the first case, you are gathering data observed outside yourself. In the second part of the exercise, you are gathering data from inside yourself. Both are powerful sources that shape your sense of attention to, and ways of knowing, something. Research on the human brain validates both of these means of perception as being equally valuable in accessing your perceptions and processing your relationships to the environment. Practice with this exercise will sharpen your perceptions and abilities to observe — and will also stimulate your potential creative connections. Creating "art works" in your journal is vital to developing these same skills. Often people say, "I can't draw." Actually, drawing is linked to seeing. The better your see, the better you draw; the better your draw, the better you see. Drawing and "seeing" both improve with practice. You are building eye-hand-brain/mind connections. As these skills improve through use, so will your creativity.



There are many sources and references for helping you maintain momentum and interest in your journal. Some are listed at the conclusion of this article. Beyond the formulation of your own goals and rules for journal keeping, I would also suggest the following simple and general guidelines for journal keeping.

1. Make the journal a place of celebration — a fun place to work. Make only positive entries. If your urge is to record the negative, turn it around by capturing the positive attributes and outcomes gained from the negative tendencies. If you are against something, you must be for something. Catch and record your wishes — and what you truly want to see.

2. Strive to create a balance of images. Sketches, paintings, pasted-in pictures, photos, postcards, collages, or objects captured under clear sheets of adhesive plastic can all be included — as well as numbers and words as expressions of your insights. Balance is the key. Ideally, I think every picture needs some textual insight; every few words an accompanying image. This is important in order to recognize and engage your whole-brained ways of knowing.

3. Take risks. This is your journal. Try colors — for

example, the two ugliest, the two most outrageous -- and use them. Experiment with different mediums -- colored pens, pencils, watercolors, and rapidograph pens. Be flexible and experiment. Stretching yourself is a key to unlocking your personal creativity.

6. Work from back to front! Use the back of your journal as a filing place to capture pertinent trivia, paste in business cards, etc. Working your journal pages from the front to the back of the journal book is a way to record your creative insights, new ideas, or images and text about newly acquired information. It is a place for the inevitable quotes you would like to remember. Simultaneously, take all your daily notes from meetings, seminars, phone calls, etc., and record them from the back to the front of your journal. Often it is appropriate to extract ideas, insights, and your own restatements of what you think is important from these back-of-the-book repositories. You can transform them into conceptual or emotional expressions of insight in the front section of your journal. This strategy offers several powerful advantages:

- It gives you a reason for always having your journal with you -- for note-taking and more.
- It helps to season you with "fill" journals in a reasonable time, providing a sense of accomplishment and closure.
- It provides time for artistic reflection that results in a more thoughtful, more finished front section; and
- It gives permission for the rear section to be quickly done, without perfectionism and onerous fancy finishing criteria.

Using the journal as a tool to nurture the growth of personal creativity and connectedness to the living planet can be a powerfully enriching experience for nearly any age person -- from the very young to the long living.

For the very young, observing and experiencing nature as well as expressing feelings can be enhanced with the journal. It serves as a place for private expression and documents facets of growth. My grandchildren began their own journals -- on their own initiative -- at three and four years old. They are now amazed at their early work when they look back at it through the "grown" eyes of six and seven year olds. They are each well into their third hardbound volumes. Having to learn to discover and mix the "magic colors" from a paintbox that has only primary colors and black -- and to gather artifacts and images from trips to the backyard, museums, friends, and beaches -- tells a tale of growth, risk, and more growth. They are able to recall aspects of their life and growth from the powerful source of their own authorship -- instead of relying only on images from someone "omnipresent eye."

As is true of so many of our south Florida citizens, my dad's journal is just beginning -- at age 77 -- as he goes to gather a history of a family heritage.

Journal mentorship is helpful. Voluntary journal-sharing sessions among family and friends can be rich and motivating. The key is to begin. If several people can share their journal insights periodically, so much the better for motivation.

The journal is an empowering tool for enhancing personal creativity. It is a place to establish and practice important rituals of your making. It is a place to record insights -- to nature, the living planet, one's self, and others. It becomes a record of risk, growth, and new insights. It is a place to express your personal ways of knowing. It is a whole-brained approach to accessing feelings and intellect about things that matter. Literate cultures have used writing to separate the known from its context for more than 3000 years. The creative journal can be a medium to moderate the limiting impacts of literacy on thinking -- while supporting and expanding the gifts of literacy. Images, artifacts, color, emotion, and visual are some of the tools of the whole brain that find a new medium within a creative journal. The journal keeper is empowered. Through a sense of empowerment comes a willingness to take informed risks and to grow. In this way, creative growth is nurtured within the human spirit. It is a fascinating journey. Why not find a blank book -- and take the first steps to come along?

Resources

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• Samples, Bob. *Open Mind, Whole Mind: Parenting and Teaching Tomorrow's Children Today.* Rolling Hills Estates, CA: Jalmar Press, 1987.

Bill Hammond is an outstanding educator and naturalist. He has been acknowledged with numerous awards for his work, including the prestigious 1989 Conservation Education Award from the National Wildlife Federation. The work of his educational center for children as part of the Lee County, Florida, schools was recently recognized by the National Science Teachers Association. Bill was the keynote speaker at the 1989 conference of the Environmental Education Association of Oregon in Portland. Bill can be reached for additional information at the Lee County Schools, Environmental Education and Instructional Development Services, 2055 Central Avenue, Ft. Myers, Florida 33901.

Oil Spill! Disaster or Opportunity?

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Environmental Issues in the PNW

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Environmental Issues in the PNW

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A Sample Unit of the Critical Thinking Center: Birds

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Environmental Education
in the Pacific Northwest

Eagle Watchers to Ecologists: Bellingham Middle Schoolers Count Eagles

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part their majestic forms suggest. Unafraid, they cruise overhead, primary feathers spread on their wingtips, allowing them to fly effortlessly making only "fingertip" adjustments as they patrol the riverbanks for food.

Food in the form of chum salmon supports a myriad of life on the Nooksack. Dolly Varden and white fish gorge themselves on fish eggs poorly covered by protective gravel in the back channels. Low flying common mergansers thrive on the eggs and fry of salmon. Even birds like the little water ouzel or "dipper" paddle along the shore picking up floating salmon eggs or diving to snatch one in the loose gravel of the river bottom. Though numerous, these other creatures are dwarfed in importance by the couple hundred eagles that stop here each winter to dine on the spawned out carcasses of dog salmon.

To understand eagles is to understand salmon. So we walked through the Indian Plum and Salmonberry brush, thorny wild rose and towering cottonwoods to the gravel bars that are home to spawning salmon and dining table to bald eagles. We were looking for a special back channel that the dog salmon would prefer. They will seek for their redds (or spawning sites) a channel which is lower than the main river but close enough that the hydrologic pressure from the main river will cause a steady flow of aerated water to percolate up through the gravel of the back channel. This year the chum salmon crowded the small channel we chose with their writhing gray bodies. We knew the salmon eggs were there, though most of the fish were gone, because the stream bed was not smooth. It was pocked with redds as though giants with round feet had danced down the stream.

Mark, who had walked right up the middle of one back channel soaking his moonboots, was first to notice the tell-tale signs of percolation. In the bottom sand he pointed out the hundreds of tiny sun volcanoes. Activated by the constant upward flow of water, they produced tiny cindercones of sand. Near the redds lay the slime-covered, moldling, stiff carcass of a chum salmon, one whose mission in life was now complete. A pinkish-red eye socket told us the gulls had extracted their favorite hors d'oeuvre. Now the carcass needed to age before gulls or eagles begin the main course by punching a hole with their beaks into the visceral chamber just behind the gill plate. In time, this carcass will be only rumpled skin and vertebral column with its perpendicular spiny ribs white against the black andesite littered bar, it's body and eggs having nurtured a multitude of creatures.

We continued our count of the eagles moving by bus upstream to our next viewing point. On the bus, the students finalized their tally count for Welcome Bridge station. Eyes pressed to the side windows of our unlikely bird watching carriage, we moved toward mile 1.5 on the North Fork road. Relocating to mile 1.5 moves us far enough upriver that we can be reasonable sure we're not doubling up our count. Stumbling over the round, uneven cobble of the bar and trudging through wet sand and snow, I could not help admire the freedom and grace with which the bald eagles moved over this same terrain.

Roger pulls our unwieldy bus off to the side of the narrow road and the eager observers disembark. "When's lunchtime?" asks Joe. It wasn't that he was so hungry; just that he needed to know how long to conserve his dwindling supply of chips, most of which he'd consumed since the last stop. Assured that lunch would come, we pressed over the murky road embankment to the flood sculpted bar.

Our count continued, repeating the process: field glass up, count mature and immature bald eagles, tally, return to the bus, stop again, out to the bar, etc. By mid-afternoon, several inches of wet snow added a new dimension to the adventure - snowballs. The eagles now were watching us more than we watched them.

Back on the steamy bus for the last time, the students finished their totals

Environmental Education
in the Pacific Northwest

for the day and we computed, from soggy tally sheets, the results of counting eagles on the Nooksack. When the abundances were figured, we realized this had been a special day. A cheer rang through the bus at a record count 89 matures, 52 immature eagles. Total: 141 eagles.

For most of the students, these were the first live eagles they had ever seen. In these young people we were cultivating a resource nearly as rare as the eagles we had seen. Here was a group of future citizens who saw with their own eyes a tenth of Washington's eagle population. Perhaps they will be the ones who assure that other generations will also be able to see record numbers of eagles on the Nooksack.

EAGLE ACTIVITIES

Activity: Grades K-6
Eagle Walk

Take your students on an "eagle walk" around the school grounds or through the community. During the walk, ask students to respond to questions such as these: If eagles could live here, where would they make their homes? Could eagles have lived here many years ago when this are was not like it is now? Are there any animals we see around here that might be prey for an eagle? How could we make this area a better home for eagles and other wildlife that already live here? You may want to take along a Polaroid camera to record special moments along the way. These photographs will enhance a language experience story or creative writing lesson when you return to the classroom.

How does your trip compare to the one taken by the Whatcom Middle School students?

Activity: Grades K-3
If I Were An Eagle

Share the poem "If I Were An Eagle" with your students. Have students create new verses and share the verses with the other members of the class. Ask them to imagine what it might be like to be an eagle.

If I Were An Eagle
by Stan Kulewicz

If I were an eagle
My arms would be wings
My feet would have talons
To grasp on to things.

If I were an eagle
I'd have two shiny eyes
My sight would be keen
Spotting prey from the skies.

If I were an eagle
My home would be a nest
With sticks, leaves and branches
I'd make it the best.

If I were an eagle
What fun it would be
But I think I'll stop dreaming
Because I like being me.

(Activities from National Wildlife Week 1981 Packet "We Care About Eagles," published by the National Wildlife Federation, 1412 16th Street, N.W., Washington, D.C. 20036.)

The Storyteller— and the Natural World

by Susan Strauss

The question is: Can the transformative powers of storytelling be used to mend modern man's lack of sensitivity to the natural world? The second and perhaps more important question is: How can this be done without the smell of moralizing or becoming blatantly didactic?

Let me start with a story.

I was in a rural California school, north of Sacramento giving a performance of my program, "The Bird's Tale." These are myths and folktales which focus on the bird as a symbol. In my introduction, I was trying to elicit qualities that the children in my audience would associate with birdlife, such as freedom, grace, easily frightened, fragility, etc... I asked, "How do you feel when you watch a bird soaring in the wind?"

"Like shooting it!" said one boy in the front row, a brash glint in his eyes. I was taken aback. He beamed... proud of having affected me so instantaneously... perhaps.

I mumbled something about, "yes, shoot it, yes, kill it... well, maybe because it's so beautiful... so out of reach, that we want to kill it... pull it down... have some control over something that seems so out of reach." There was nowhere else to go with this discussion. So, I collected the silence of the room and began to tell the story of "The Hundredth Dove."

For those who don't know it, "The Hundredth Dove" is about a gentle fowler who is commissioned by the king to capture one hundred doves for the royal wedding feast. The king is marrying an extremely beautiful woman whose manner and appearance resemble a dove. When the fowler meets the prospective queen, he is so taken by her soft beauty that he trembles as he reaches to kiss her hand in respect.

The fowler is determined to be a good servant to the king and manages to capture a few doves each day in the meadow. But each day one dove slips from his net. This doesn't disturb him until he discovers that this white dove is the last of the flock and the hundredth dove. Finally, he manages to grasp the dove as she slips from his net. He holds her in his hand and she speaks. She begs the fowler for her freedom in exchange for all sorts of treasures. None shake the fowler's profound sense of duty to the king. But then, the dove offers the love of the queen. In a desperate confusion between duty and love, the fowler breaks the dove's neck.

The next day, he returns to the castle with the hundred doves, ninety-nine in a cage and the limp white one in his hand. He discovers that the wedding has been cancelled because the queen has mysteriously disappeared. Knowing his part in this, the fowler gives up his service to the king and lives out his life in sorrowful solitude.

The brash little boy in the front row sat with his eyes as deep as a dove's throughout the telling of this story. In his eyes, I saw something of transformation. Who knows what might have been going on in his mind, but he sat in perfect stillness for the rest of the performance as he had for "The Hundredth Dove."

This, for me, illustrates a clue to the power of storytelling in the field of natural history education. Through the disarming content of the story (the child thinks "it's not really about me, but someone else") and through the pictures created in the story, the teller takes the audience into a special world which is about them. It is a field trip... with the experience of landscape, with the vision of our place in that land-scope, and with a heartfelt, heart-endearing response. But without "fire or bag hatch". Actually, a storytelling experience is an internal field trip where the meadow is brought into the heart of the listener rather than the listener brought into the meadow!... with hopes that his heart will follow. As the pictures seep into the imagination of the listener, the meadow becomes his meadow, the dove. So, as the fowler breaks the dove's neck, the listener feels, within, some of the fowler's remorse and confusion of values. There is no moralizing about the killing of animals, only the experience. It is because of this personal internal experience of story images that children in my audiences have remembered a story image for image, sometimes word for word, two to three years after a telling.

This remarkable evidence of memory is not due to the clever characterizations of animals, but to the evocation of meaningful place in animal totem. Every child, no matter how old or how raised, will recognize the dove for its special spiritual symbolic totem power. They will know it as the love, grace or beauty that has appeared in their own life.

To depict a naturalist, this type of talk smells of the dreaded anthropomorphism. Doves don't talk and they aren't always lovey dovey. So, how is the storyteller bringing people closer to the "real" world of nature?

I would propose that myth is a bridge between people-centered consciousness of modern human beings and the foreign world of nature. By identifying with the dove, the eagle and the bear within one's own nature, a person might become a more keen observer of this animal in the world. When next encountering this animal on a TV program or on a hike, one might look to find just a little bit more of oneself in the animal's nature.

Jungian psychologist Joseph Henderson says that when we care for the animals within us, in our dreams, we are more able to care for the external animals as well. The same is true for stories of plants and of landscapes. A frequent listener to "totem" stories of nature will begin to recognize valuable life force in the particular attributes of various animals as they recognize those attributes in themselves and friends. When this connection has taken place, their mind will be like a sponge for "the facts."

The type of story that is chosen for natural history education does not have to be a myth or folktale to have this unconscious impact. It can be a "true life" story as long as it speaks to the totem of the animal. Such a story is one I found Barry Lopez's book *Of Wolves and Men*. He writes:

> *Wolves are extraordinary animals. In the winter of 1976 an aerial hunter surprised ten gray wolves traveling on a ridge in the Alaska range. There was nowhere for the animals to escape to and the gunner shot nine quickly. The tenth had broken for the tip of a spur running off the ridge. The hunter knew the spur ended in abrupt vertical drop of about three hundred feet and he followed, curious to see what the wolf would do. Without hesitation, the wolf sailed off the spur, fell the three hundred feet into a snowbank, and came up running in an explosion of powder.*

I have noticed that young boys are very moved by this story. It captures what I consider to be the wolf's totem qualities: courage, endurance, quiet mysterious reserves of power. In Native American folklore, these same qualities are embodied in the wolf myth character. Such "good wolf" characters can also be found in Russian and European myths and fairytales.

Native American myths go even beyond the symbolic or totem value of nature and weave actual natural history information into the story telling. For instance, spider woman, who is anthropomorphically patient, also makes the strongest rope of any in the animal community. In another story, Frost is a white character, with white snow. He becomes the hero when he breaks down a rock wall by blowing on it, turning it white and slowly crumbling the rock. Native American myths are, to my way of thinking, the best myths to use in natural history education of Native American ecosystems for the simple reason that they are indigenous to this landscape. But certainly, someone who might do a presentation on the bear should also research what the bear has meant to people all over the world and find the folktale of what "bearness" is.

The Storyteller and the Natural World

Now, we come to a very crucial issue in this subject of storytelling for transformation or education of an audience: moralizing. Overall, I believe that if a teller comes to a story with a directed moralizing attitude, they will create more resistance than desired effect. In telling "The Handsome Dove," I must know that the fowler is also myself and have compassion for the intensity of his internal conflict. I must know that I am and have been quite capable of killing beauty and that this is true for each member of my audience. Also, I must know that following duty is not always a destructive thing. This developed attitude of introspection prevents the teller from becoming a finger pointer and creating a situation in which the audience feels attacked and then becomes defensive. I experienced this once when I attended an Earth First presentation. Of course, I sympathized with their point of view, but I have to confess that their attitude in presentation was so didactic that I left the program feeling like I had to go out and kill something.

Going back to the issue of "good evil" stories, we can examine another side of this coin. Animals such as the wolf, the snake, and the bear have all gotten bad press when it comes to the world of myth. These mythic animals are often carrying the personification of evilness, danger or aggression. Should we eliminate that story from a program? Certainly, it is true that a snake, tiger, or bear will bite and/or eat you if provoked. I think certain snakes today have been so terrorized by man that they are too afraid to attempt an attack. But, at one time, it is possible that they might have. Human beings have [illegible] with dogs. Isn't [illegible] the natural way of the world? Nature is dangerous as well as peaceful. Part of its beauty and part of our awe and respect for it is tied up in this danger.

One storyteller handled this issue in a clever way. I observed Alice McGill, from Washington D.C. tell the story of Brer Opossum and Brer Snake. She framed this folktale with a true story from her youth. She explained that as a child, she hated snakes. Everytime she saw one, she wanted to kill it. (At this point, every snake fearing member of her audience gives out a little giggle of relief and, feeling somewhat disarmed, enters deeper into her story.) She told how she discovered a snake one day and ran screaming to her grandmother, "There's a snake! There's a snake! Get the hoe!" When her grandmother found out what had upset her and how she intended to kill the snake with the hoe, she sat her down and told this folktale.

In this story, Brer Opossum is going down the road, and he comes to a pit. He knows he should mind his own business, but he looks into the pit. Brer Snake is at the bottom of the pit with a brick on his back. He begs Opossum to free him by pulling the brick off his back. Opossum, of course, is worried and says to himself, "If I help Snake go free, he'll probably bite me." Snake begs and begs. Finally, Opossum relents and finds a long stick to loosen the brick.

Now, Snake begs Opossum to lift him out of the cold, cold pit and into the warm sunshine. Again, Opossum deliberates about the danger of dealing with Snake and how he would be better off just going on his way. But, instead he helps Snake out of the pit with that long stick, rationalizing that with the stick there can't be any danger.

Now, Snake begs Opossum a third time asking Opossum to put him into his pocket because he's cold on the damp earth. Oh, well, Opossum is worried, but finally relents to Snake's pleading. Once in the pocket, Snake tells Opossum that he's going to bite him. Opossum says, "You made me [illegible] I helped you with the brick, the cold pit and the damp earth, yet you're going to bite me?" Snake says: "Well, you knew I was a snake when you put me in your pocket!"

And so, the grandmother tells Alice, "Let that be a lesson to you! Don't you never trouble trouble, till trouble troubles you!"

In this telling, the snake-fearing listener's fears are acknowledged, but we also learn to respect the snake's power and our place in dealing with it. In the end, the snake is accepted. He doesn't have to be destroyed in response to the truth of his dangerous nature. A teller does a disservice to make all wildlife "[illegible] good" and create an attitude of beauty and peace without a balanced respect for the violence, death and destruction which fulfills an important function in the natural world.

In the world of interpretation, the job of the storyteller is to bridge the gap between human beings and natural world. Being that human beings are governed by their psychological nature, the ultimate job of the teller is to work with the fears, ignorance and deep sympathies of their audience.

Environmental Literacy:

A Critical Element of a Liberal Education for the 21st Century

by Milt McClaren

Developing Environmental Literacy

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Elements of Environmental Literacy

1. The Ability to Think About Systems

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Developing Environmental Literacy (continued)

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Developing Environmental Literacy (continued)

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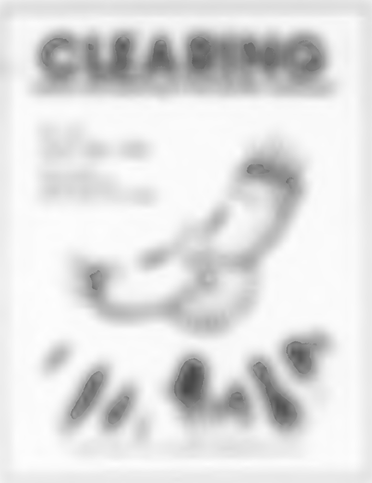
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Volume IV · Issues [illegible]

a collection of ideas, activities, and resources for teaching about our environment

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Volume IV: Issues [illegible]

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Compiled by the Environmental Education Project

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environmental education in the pacific northwest

Earth Kinship: The Fabric of Personal and Global Balance

by Michael J. Cohen

from the proceeding of the 1988 conference of the North American Association for Environmental Education

At the beach last week, without educators, psychologists, or spiritual leaders on my mind, I tied up a dog to prevent it from chasing migrating shorebirds. Instead of thinking about the work of these social practitioners, a clear plastic television antenna cable that I found amongst the beach debris preoccupied me. The cable served well as the dog's tether — an unheralded spinoff of RCA and Zenith.

When I looked at Fido from down the beach, the transparent cable created an amazing illusion, for it acted like an invisible bond which prevented the hound from achieving its desire to chase wildlife. The dog would run towards a bird and suddenly, as if by magic, slow down and stop in his tracks.

It was then that the frustrating efforts of educators, psychologists and spiritual leaders came into mind, for as they attempt to help people attain healthy personal, social, and environmental relationships, invisible signals and bonds thwart their efforts, and they must deal with this problem. Their problem, however, is that they often know as little as anybody else regarding the nature and source of modern people's bonding. Why? Because they're modern people too.

Although modern science recognizes that all elements of the global life community are interconnected, we seldom fully identify these connections. They extend far beyond the plant succession, instincts and food chains that we study in ecology, yet they are the communications that allow the global life community to organize, perpetuate and regenerate itself. Since we are part of that life community, its communications must somehow also signal us.

I'm only familiar with these bonds and signals because they are expressions of Nature. While I constantly camped outdoors through all seasons for over fifteen years, the natural world exposed its affinity bonds to me and taught me to respect their messages. I've seen them create exceptional trust, unity, and compassion among and within people; they're quite different from Corporate Bonds.

More than 25 different inborn sensations like hunger, beauty, suffocation, color, and thirst invisibly bond us to our environment and each other. These affinities are the essence of Gaia, the living global organism we call Planet Earth. Like ourselves and any other living being, Gaia communicates through affinities in order to maintain its own life, and thus all life as we know it.

As our modern upbringing prepares us for adulthood, it separates us from Nature within and without. In so doing it severs our natural survival bonds — our sentient kinships with Gaia — and then attaches their raw ends to our culture with its superficial artifacts and its many unfulfilling, nature-destructive ways.

The friction generated by that mismatched connection, is the immediate cause of most environmental, social and personal stress and is the *raison d-etre* of modern religions. Our disengagement from Earth's self-regulating affinities also creates that untouchable villain we call "greed."

What is it about modern society that makes it uncontrollably at odds with Nature? Scientifically, if you look hard, you find that to our cost we subconsciously desire to change the natural world into a simulation of the ancient womblike tropics where we originally evolved and lived more harmoniously. That's why average Americans spend over 95% of their lives in the artificial tropics of our homes, schools and offices, excessively fortressed and programmed away from the self-regulating pulse of the natural world.

Our separation from nature's wisdoms combined with the immediate gratifications from our artificial ways, addictively program us to artificiality and create today's uncontrollable juggernaut of destructive technologies and stresses. Sadly, our attempts to eliminate these horrors without treating them as addictions is like trying to get sober by drinking martinis.

Although we can't help but recognize the disastrous results of our nature-alienated ways, modern society continues to thwart us from changing them by tabooing, rather than validating our affinities with Gaia. The mainstream usually sees feelingful, nature-supportive attitudes as unscientific, impractical, anthropomorphic, immature, economically unsound, subjective, tree-hugging sentimentality. This leaves us few alternatives and we grow up floundering in a fishy world.

The crux of the matter is that our daily pervasive rejection of our earth kinship affinities continues to make them relatively invisible and therefore unreachable for ourselves as well as the educator, psychologist, or minister. For this reason, while we strive for change, we remain subconsciously tethered by our survival feeling's attachment to destructive environmental and interpersonal relationships. That's why most Americans identify with socially responsible causes but fail to support them in some meaningful way.

In HOW NATURE WORKS: REGENERATING KINDSHIP WITH PLANET EARTH (Cohen, 1987), I explain how my years living in the natural world taught me to validate natural affinities and thereby regenerate earth kinship in myself and others. I show that people's feelingful earth kindship bonds are exactly the same survival bonds that sustain all entities - from sub-atomic particles to weather systems. That's why on every level, survival is an emotional issue and why liberated survival feeling always eradicate apathy and addiction.

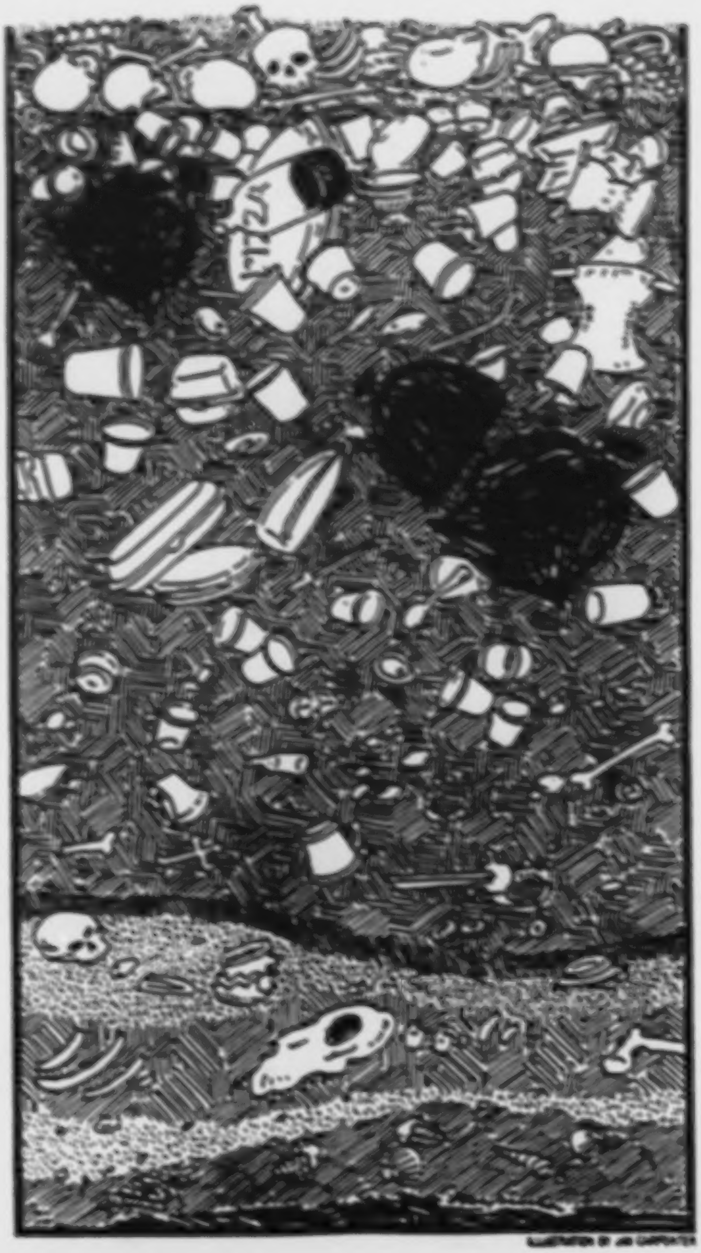
As I walked further down the beach I observed waves washing ashore. Each singular, throbbing moment expressed the evolving growth of billions of years of affinities between all of Earth's entities. In each wave's wash I watched the shore birds' affinities with Gaia direct them how, when, and where to cooperatively feed themselves while strengthening their environment. Newborn seal pups played with their mothers while bonding to the rhythms of the sea. And as the sea otters used stones to smash shells on their bellies, shoreline life was all it was cracked up to be.

As do our seashore wildlife populations, many indigenous, environmentally and socially sound human populations show us that their affinity bonds with Gaia give them a happy, economically sound, unifying sense of place, community, and trust. But our separated-from-nature upbringing binds us to modern society's destructive ways, not Nature's wisdom. That kind of binding is the global constipation that blocks environmental health and peace.

...We must weave earth kinship relationships into modern life for healthy relationships, not books and laws alone, change our environmentally destructive addictions into socially responsible living. The truth is that all educators, psychologists and leaders worth their name must help the rest of us regenerate earth kinship, otherwise they're part of the problem.

Wouldn't it be spectacular if modern life pervasively sparked a healthy planet and peace because people already felt strongly about their earth kinship and acted off their feelings?

The Plastics War — Recycle or Ban?



by Mike English
Reprinted from What's Happening
August 10, 1989

It was the perfect day to kick off a glitzy PR campaign.

It was June 21st, and the sun was shining. A mini-convoy of garbage trucks cruised by the courthouse downtown, where they picked up the Lane County commissioners. This convoy then rumbled down to Autzen Stadium, where a podium was set up for a press conference.

There, with television cameras from the local stations rolling, an assortment of county officials gathered to inform the public that Lane County was kicking off a campaign entitled "Conquer the Waste."

Lane County produces 213,000 tons of solid waste a year, enough to fill Autzen Stadium eight times each year, they said. The only way to counter this is to recycle. Encouraging recycling is what the "Conquer the Waste" campaign is all about. And part of the "Conquer the Waste" campaign is the recycling of plastics.

Ah, plastics. More than any other substance, plastics have come to symbolize all that is wrong with our disposable society. Once created they never disappear. Non-biodegradable, controversial. Plastics.

Plastics make up 25% of the volume of America's solid waste stream. In Lane County, that means two of those eight yearly football stadiums are reserved solely for plastics.

After the cameras had finished rolling that sunny day in Autzen Stadium, if you put your ear to the ground you could hear some grumbling. Plastics recycling sounds good, but there is much debate in this community as to just how ultimate a solution to the waste problem the recycling of plastics actually is. And when the topic of plastics moves to foam, or polystyrene — the substance which is used for fast-food packaging — the debate gets downright hot.

Indeed, in Eugene the issue of recycling lower-grade plastics such as foam has become something of an emotionally charged maypole, around which county politicians, recyclers, and plastics industry reps have all begun to dance. Some want to recycle foam, some want to ban it.

BRING, a long-time leader in the recycling movement in Eugene, has support a ban of foam. Bill Snyder, head of **Pearl Buck Recycling**, does not. Lane County's position is to go ahead with the recycling of most plastics, including foam.

And the debate, like the substance which spawned it, is not going away.

Untill the nation's dumps began filling up in recent years, the issue of plastic waste had not registered on the consciousness of most people. Sure, those of an environmentalist bent have never been crazy about the stuff, but the problem didn't seem urgent. Yet in the last few years the luxury of that delusion has quickly faded.

The plastics industry in one of the ten fastest growing industries in the U.S. In 1987, 53 billion-plus pounds of plastic resins were sold in the country. Eighteen million tons of plastic flow through our lives each year, including 6.5 million tons of packaging, and $3 billion worth of plastic garbage bags to throw the rest of our plastic away.

Plastics are obviously here to stay. Casually glance through any room of your house and you are likely to find their presence in some form. Plastics can be hard or pliant, dense or clear, and are moldable into any conceivable shape. They are substances of countless uses.

The grumblings arise when the issue shifts to consumer and fast-food packaging. Over this particular usage of plastics there is much debate.

Some environmentalists argue that substances which are non-biodegradable, as plastics are, should not be used for a few days, a few hours, a few minutes (as is the case with fast-food polystyrene foam) and then thrown away. The industry, on the other hand, points out that plastics packaging is more sanitary, less expensive, and takes substantially less energy to manufacture than paper alternatives.

Consequently, there are those who argue that such wasteful uses of plastic should be banned, and there are others who argue that the alternatives to plastic packaging are just as bad. Recycling, this second faction says, is the answer.

It is along precisely these lines that the controversy in Eugene has developed.

On January 25, 1989, **the City of Portland voted to ban the use of polystyrene foam by restaurants and retail food vendors within the city limits. Though the ban does not take full effect until January 1, 1990, it will effectively eliminate the use of disposable foam food containers in all restaurants.**

Taking his cue from the Portland ban, Lane County Commissioner **Jerry Rust** announced in February his own plans to propose a ban of foam. Rust cited foam as a source of litter, a threat to the ozone, a high-volume, non-biodegradable problem at landfills and a danger to wildlife. He also noted that Oregon is a paper state, and it makes better sense to utilize paper alternatives.

Hearing their death-knell, and fresh from their slap in Portland, the polystyrene foam industry mobilized to prevent a ban here. **Members of the Polystyrene Packaging Council** met with county officials and local recyclers. Realizing the Oregon is looked upon as a trend-setter in environmental legislation, the industry did not want the issue to get out of hand.

The foam industry stated that they had already voluntarily phased out CFCs (chlorofluorocarbons) thereby reducing the threat to the ozone. They assured county officials that **Polystyrene Recycling Inc.**, a $14 million company started by Amoco, Dupont, and Dow, would make the industry more responsive to recycling needs. And they promised to spend some of their money in Eugene.

Though **West Coast Plastics** of Eugene does not manufacture foam — they make two-litre pop containers and milk jugs — company General Manager **Bob Stoddart** kept close tabs on the foam issue. "We're afraid of a landslide situation," he says. "It would be first 'Let's ban polystyrene,' then 'Let's go for something else,' and pretty soon we're drinking out of cartons and glass bottles again. We could have another spotted owl thing within the plastics industry."

Stoddart's company is representative of the new-found willingness of the plastics industry to support recycling. "We're very flexible as to what we can do with our particular products," he says. "We want to work with recyclers. We want to be a good neighbor."

The Lane County commissioners were receptive to this new tune, and the plastics industry's lobbying efforts paid off. Jerry Rust changed his mind about his earlier call for a ban, and the county decided that recycling plastic — and polystyrene foam — is the best approach.

Rust says now that his earlier call for a foam ban was "knee-jerk."

"Here's how it went for me," he says. "'Polystyrene foam? Boy, that's bad stuff, it's ubiquitous, I hate it, doesn't it have something to do with killing the ozone?' But I found out the CFCs have been removed, and when the foam industry said they'd been derelict and were willing to put some money into cleaning up their act, I felt a pilot recycling program was the best approach.

"It's the first time I ever got criticized roundly for trying to recycle something," Rust adds.

But what about the non-biodegradable litter problem of foam? "It is a litter problem — it has a bad effect on the environment and waters, that's true. But I felt that the industry's promise to be responsive made a pilot recycling program worthwhile."

On the night of July 20th, the board of BRING Recycling invited Bill Snyder, head of Pearl Buck Recycling, to their offices for a discussion of the differences which had emerged in the recycling community over the recycling of plastics. Though each company recycles other plastics, they each had opposing views on foam.

Snyder, who had initiated the recycling of plastics at Pearl Buck in January, had long been on record as one who was opposed to a ban of foam. In a March 31 letter to the *Register-Guard* he cautioned that, "Before we ban anything, let's be sure the consequences are ones we can live with." Snyder's main point is that **foam packaging is recyclable while its wax- or plastic-coated paper alternative is not. Paper and plastics packaging are both responsible for overcrowded landfills, so why ban the one that can be recycled? He also feels that recycling is a viable method of reducing solid waste problems caused by foam and other packaging.**

This position differs from BRING's, which is that foam is not worth recycling and an alternative packaging is needed. In a meeting of the county commissioners in mid-May, BRING's General Manager **Bruce Philbrick pointed out that even if foam is recycled it cannot be used again for its primary purpose, which is food packaging.** Given that one-third of the foam industry is tied to fast foods, there will be a constant demand for fresh foam — and an exponentially growing mass of foam on the planet.

In the aftermath of that meeting, BRING has stepped away from calling for a ban of polystyrene foam, and in general, members don't like to talk much about the

(continued on page 10)

(continued from page 9)

substance. Currently they are under contract with the county to collect plastics for recycling at the Glenwood dump, and that includes foam. That substance they ship to Pearl Buck.

BRING's Bruce Philbrick feels that if Snyder and Pearl Buck can viably recycle foam then he is all for it. "If he can successfully recycle foam, that's great," Philbrick says. "It's a substance whose presence in the waste stream we need to reduce, and more power to him if he does."

Yet what of the environmental concerns about foam? "Foam is objectionable to people because it so often ends as litter," Snyder says. **"But I think we do far more environmental damage with paper than plastic." To back up that statement, Snyder points to the dwindling supply of trees and the voluminous toxins, such as dioxin, produced by the paper industry. He also points out that production of plastic is more energy efficient than paper production.**

"Our economy is built on growth and the consumption of natural resources, and that needs to change. Doing more with less makes sense. Compared with paper, plastics food packaging, in my estimation, is doing more with less."

While the debate has quieted in past weeks, it has not disappeared. Lane County has implemented its own recycling program, but on the state level the possibility of a ban of polystyrene foam still exists. **State Bill 990**, which would ban the usage of food-related foam packaging, was tabled by the legislature at the end of the last session. **The sponsor, Sen. Dick Springer, D-Portland, plans to resurrect the bill as a ballot initiative.**

The Springfield City Counil is also considering banning polystyrene foam. The issue will be considered at a council meeting next fall.

In the meantime, certain aspects of foam recycing remain unclear.

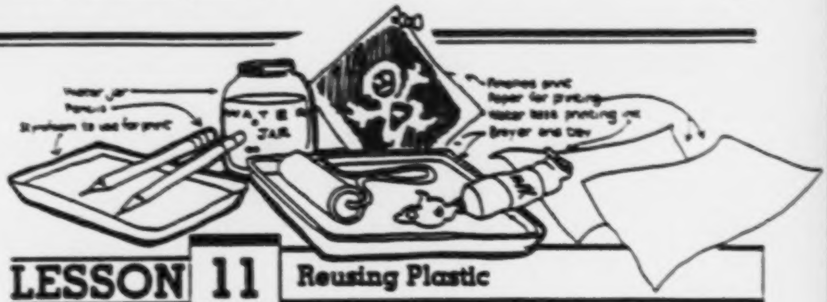
The viability of markets for recycled foam has been a major point of contention between BRING and Pearl Buck. Brokers at four of the Northwest's leading plastics recyclers — **Denton, Wastech, Pacific Resource Recycling, and Partek**, all in the Portland area — state that the market for recycled plastics is here to stay. Yet they admit that when it comes to the issue of making money with recycled foam the prospects are "up and down" at best.

"The economics of plastics recycling remain rotten," says **Jerry Powell**, editor of the Portland-based *Plastics Recycling Update*. "Most clean and separated plastic can be recycled — there is a market — but the cost of cleaning and separating is very high, and that's when profits go out the window."

And quite outside the matter of market stability, other key questions remain: Should the polystyrene foam industry, whose interest it is to manufacture and sell as much foam as possible, be entrusted to subsidize and promote the recycling of our mounting piles of foam waste? Will the recycling of polystyrene foam simply encourage its unchecked use?

On the other hand, is the use of paper packaging any more desirable than the continued use of foam, when both types are responnsible for overcrowding the landfills? Shouldn't both of these substances be subject to regulation?

This much remains clear: plastics are now being recycled in Lane County, and that includes polystyrene foam. But whether the recycling of polystyrene foam is the best course for this county and this planet... on *that* issue the jury, it seems, is still very much out. ☐



LESSON 11 Reusing Plastic

Objective: To use waste materials to make art projects.

Subject Area: Art.

Materials Needed: Styrofoam trays used to package meat in supermarkets; a flat-surfaced tray to use as a paint rolling surface; newspaper; poster paint or brayer printing ink (water soluble); scrap construction paper; scissors; a pencil for carving; a brayer (roller) or sponge.

Procedure/Activity: Have the children bring the styrofoam from home, rather than buying it. Tell the students to be careful not to crush the styrofoam. Discuss using scrap materials for projects rather than new materials.

Spread out newspaper to work on. Have the children cut a printing block out of the styrofoam, making it any shape they like. Using a sharp pencil, have them draw a design on the styrofoam.

Place a spoonful of poster paint or water soluble ink in a shallow tray, rolling the paint out with a brayer or sponge into an even layer.

Have the children roll an even layer of paint onto their brayer or have them dab a sponge into the paint. Tell them to roll or dab the paint over the styrofoam block, keeping the paint out of the pencilled design.

Place the styrofoam block, paint side down, on a piece of paper. Tell the students to press the entire area of the block with their fingers to make sure the paint transfers to the paper. Putting newspaper under the paper makes a better print.

How much waste did we create by using styrofoam? Did we throw anything away? Water soluble ink is better for the environment than oil base ink because oil requires turpentine to clean it up, and turpentine can pollute water and soil.

Discussion: Styrofoam and plastic are made from petroleum. Can you identify some objects made of plastic?
Could we make these items from other materials besides plastic?
Have you ever noticed plastic litter?
Does it decompose as fast as paper or metal?

When thrown along the side of a road or in a landfill, plastics last for thousands of years because of their strong chemical bond.

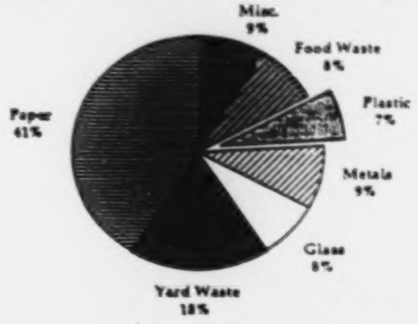
Follow Up: Draw a picture of the piles of plastic that might be found by archaeologists 10,000 years from now.

Write a poem to go with the picture. Display these in your school, a library, a recycling center, or the Solid Waste Management office.

PLASTIC RECYCLING

The issue of plastic packaging and the solid waste dilemma have been one of the most hotly debated issues around the country in recent months. Much of the energy has been spent on efforts to ban polystyrene packaging and replacing it with alternative packaging. The following information is provided to show some of the implications of this action, comparing the relative merits of plastic vs. paper packaging. This information is not intended as a promotion of plastics by CLEARING magazine, but to show realistically the tradeoffs and alternatives we face when dealing with this, or any other controversial environmental issue.

Plastics in the Solid Waste Stream



160 Million Tons

This chart shows the composition of municipal solid waste. Paper products and yard waste represent 59 percent by weight, with plastics, metals and glass each falling in the 7-9 percent range. Polystyrene represents about .26%

Packaging, which has been targeted by several states in their new waste reduction strategies, represents about 30 percent of the municipal solid waste by weight.

The primary **packaging materials** are paper and paperboard, with a **48% share. Plastics** make up about 13 percent of the materials used in **packaging**, or approximately 7 million tons in 1987.

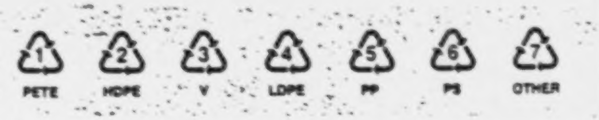
How are plastics recycled?

Plastics are collected and sorted by their resin types (HDPE, PET, PS, etc.), melted down and remolded into new products. Plastics used in the food industry (trays, cups, utensils) are generally not reused for further contact with food products. When sorting is not possible, mixed plastics can still be melted and reformed to make a variety of products. See page 15 for an example of recycled mixed plastic uses.

What kind of plastics are there?

In the manufacture of plastic products, there are currently 26 different polymers being used. Hundreds more are being developed in laboratories, each with a specific property to meet a specific product need, such as flexibility, resistance to heat, or rigidity. The prinicipal plastic types include polyethylene terephthalate (PET), high density polyethylene (HDPE), Vinyl (V), low density polyethylene (LDPE), polypropylene (PP), polystyrene (PS).

In an attempt to make sorting of plastic easier, the plastics industry has developed a coding system to identify polymer types in plastic packaging. These symbols will soon be appearing on many plastic products:



What kinds of plastic are recycled?

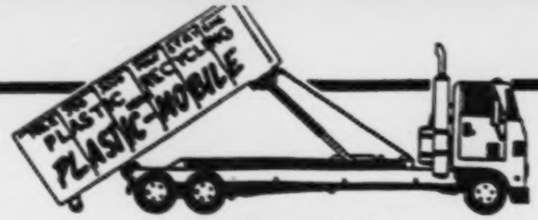
In the U.S. at the present time, polyethylene terephthalate (PET) and high density polyethylene (HDPE) are being recycled on a limited basis. the major logistical problems associated with recycling these compounds are cleaning the items and the volume-to-weight reduction necessary for cost effective transportation.

Considerable progress is being made toward developing recycling systems for other forms of plastic.

Mixed plastics, which combine all types of resins, can also be recycled. New technologies are in place that can produce molded plastic "lumber" from mixed wastes. See page 15 for more information.

Can it be done?

The answer is yes. Plastics have always been recyclable. The difficulties in collection, cleaning and sorting have been the primary hurdles to effective recycling. With the looming closure of most of this country's landfills, the need to deal with the problem of solid waste has become more urgent. The plastics industry, while being accused by environmental groups as only responding to impending bans on their products, have nevertheless poured large sums of money into the development of recycling technologies and the development of markets for recycled plastic products.



Who is doing it?

Plastic recycling is still in the early stages of public acceptance. There are limited plastic recycling plants, and because of that, very few recycling companies will take the time or expend the money to collect plastics at the curbside or in drop-off centers. As markets for recycled plastic products grow, the number of recycling centers taking plastics will grow, and as a result the ease of recycling for the public will grow. At this time, the plastics industry is spending millions of dollars to help develop new technologies and create markets for recycled plastics. This subsidy will slowly be withdrawn as markets become self-supporting and the public learns to separate their plastics along with their newspapers, tin cans, and bottles for recycling.

The first two prototype polystyrene recycling facilities, located in the U.S., started operation in the fall of 1988. One project is sponsored by 20 New York City McDonald's restaurants, in conjunction with Amoco Foam Products. The second facility, a $4,000,000 venture in Leominster, Massachusetts called Plastics Again, is a joint effort between the Mass. School system, Genpack Corporation, and Mobil Chemical Company. The recycled polystyrene can be used for making coat hangers, flower pots, wall and building insulation, and protective packaging.

In addition, Amoco Chemical Company, ARCO Chemical Company, Dow Chemical, Fina Oil and Chemical Company, Huntsman Chemical Corporation, Mobil Chemmical Company and Polysar Incorporated have developed the National Polystyrene Recycling Company (NPRC). The NPRC goal is to recycle 25% of all disposable polystyrene by 1995, which exceeds the current rate of paper and glass recycling in the nation. To meet this goal, it will require developing a national program for recycling and establishing five regional reprocessing recycling facilities by the summer of 1990. One of the facilities will be located in Oregon.

What about degradable plastic?

Traditional plastics are non-biodegradable. While this is a drawback in terms of plastic and polystyrene litter, and in terms of the solid waste problem, discarded plastic is inert in the enviroment and will therefore not be producing additional pollutants through a breakdown process. Recently, a great deal of research has been conducted towards the development of degradable plastics. Photodegradability is achieved by the addition of light-sensitive components to the plastic resin. Plastics can be made biodegradable by the addition of cornstarch or a medium equally edible by microbes.

Degradable plastic products are of questionable environmental benefit, due to the increased quantity of plastic polymer required to maintain the desired strength and due to the fact much of the plastic ends up in landfills with an environment non-conducive to degradation. These additives do not actually degrade the plastic, but rather allow the plastic to break down into very small pieces. Polystyrene is not biodegradable and manufacturers are not actively developing a biodegradable product.

Energy Value Upon Combustion

Material	BTU/Pound
Plastics	
• Polyethylene	19,900
• Polypropylene	19,850
• Polystyrene	17,800
Rubber	10,900
Newspaper	8,000
Leather	7,200
Corrugated Boxes (paper)	7,000
Bituminous Coal	2,900

Energy value of plastic and other materials

Source reduction and recycling are not expected to solve the solid waste dilemma by themselves. Even if we meet the EPA goal of recycling 25% of all materials by 1992, there will still not be enough landfill space to accomodate the remaining 75%.

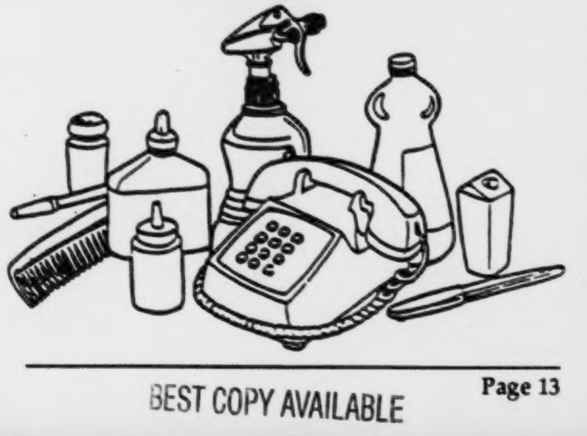
Another option for dealing with the solid waste problem is **burning our garbage**, including plastic, in waste-to-energy plants that use the resultant heat to produce electricity. One example of such a plant is the **Ogden-Martin facility** in Brooks, Oregon, just north of Salem.

Plastics, when incinerated, have a higher energy content than do most other materials, including coal. Emissions from burning are strictly monitored and controlled through **state-of-the-art pollution control devices**, and residual ash is currently being landfilled. Europeans and the Japanese already burn the great bulk of their garbage in this manner. But these plants are very expensive and politically controversial, and finding acceptible building sites is extremely difficult.

LESSON 13

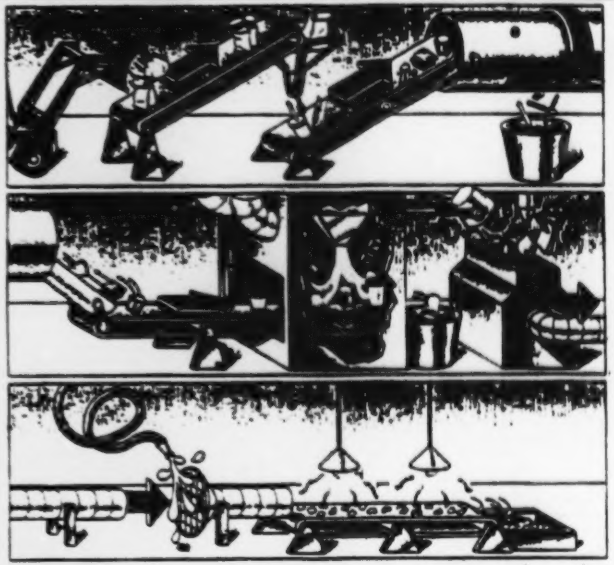
Plastics – Where Do They Come From?

Objectives	To understand that plastics are synthetic, not natural.
Subject Areas	Oral and written language, science, math.
Materials Needed	A chalkboard; 20 examples of waste materials (glass, paper, aluminum, etc., with half the examples made of plastic).
Procedure/Activity	Write SYNTHETIC and NATURAL on the board. Discuss what each word means. Identify the 20 waste materials and classify them under the correct heading on the board. Look at the SYNTHETIC heading. Most of these objects are made of what material? (plastic) Where does plastic come from? Is it natural? (no) How is plastic made? (from petroleum) Name some other things in your home, in your car, and at school that are made of plastic. Write a cooperative story on "where do plastics come from" on chart paper, eliciting responses from the students. Read the story aloud.



Polystyrene and the ozone layer

Prior to 1989, the polystyrene manufacturing industry used fully halogenated chlorofluorocarbons (CFCs) as blowing agents in the manufacturing of several products. Due to the public outcry concerning the action of highly-reactive CFCs in causing the depletion of the ozone layer, the polystyrene food packaging industry switched almost entirely to a combination of pentane and carbon dioxide. Although over 95% of containers now on the market no longer use CFCs, many of the initiatives to ban polystyrene products have arisen from the ozone depletion issue.



Both Amoco and Mobil are recycling used coffee cups and food trays from fast-food restaurants and schools. Here's how they do it at Amoco's Brooklyn test factory.

① Mixed waste is placed on a conveyor belt.

② A rotating drum separates small particles, such as food wastes.

③ An air classifier separates foam and paper from heavier coated papers and beverage containers.

④ Paper pulp is removed after immersing in water.

⑤ Polystyrene flakes are screen-washed, dried and ready for reuse.

Other wastes become fuel pellets for incinerators.

What are the barriers to plastic recycling?

A blueprint for action on plastic recycling, developed by the plastic industry, focuses on breaking down barriers that could hinder the growth of plastics recycling. It will address the four essential ingredients necessary for recycling to work:

1. COLLECTION

Research has shown that curbside collection of recyclables is the most effective means of recovering materials. Drop off sites and buy-back centers produce relatively low recovery rates. Currently, only sixteen states either have or are about to legislate mandatory curbside recycling. Successful plastics recycling will require large volumes of plastics to be available through the public.

2. SORTING/HANDLING

The technology for processing mixed recyclables is developing rapidly. It is now possible to separate most of the recyclables with mechanical systems. Plastics separation is more difficult, and the degree of sortation needed will be determined by the potential markets for the products.

3. RECLAMATION

The number of facilities designed to deal with large amounts of post-consumer plastic are few at this time. As the markets develop for recycled plastics, the willingness of investors to build new plants will grow.

4. END-USE MARKETS

The industry is working to develop strong end-use markets for all types of post-consumer plastics. With strong market demand, plastic products will be pulled through the collection, handling and reclamation stages of the recycling process - never entering the waste stream. This market-driven appproach will avoid the **supply and demand imbalances plaguing recycling programs that emphasize collection, but fail to stimulate market demand for the materials being reclaimed.** At this time, the plastic industry is investing millions of dollars to support plastic recycling plants and the development of recycling technologies.

Markets for recycled plastic

The number of new end-use markets for collected and reclaimed post-consumer plastics from packaging is growing daily. Lists of potential markets for recycled plastics can be found throughout this article.

Recycled Mixed Plastics Products

AGRICULTURE
  Barrier Retainers
  Duck Boards
  Electric Fences
  Erosion Control Timber
  Fruit Tree Supports
  Gates
  Horse Stalls
  Markers
  Pig and Calf Pens
  Poultry Construction
  Ranch Fences
  Tree-guards
  Vine Stakes

INDUSTRIAL
  Car Stops
  Fencing
  Flooring
  Footings, Posts, and
    Sill Plates
  Highway Construction
  Loading Dock Rails
  Markers
  No-load Grating
  Pallets
  Pipe Racks
  Planks
  Sign Posts
  Slab Separators
  Stair Treads
  Traffic Barriers
  Truck Flooring
  Wire Racks

MARINE ENGINEERING
  Beach Erosion Control
  Board Walks
  Boat Docks
  Coast Erosion Protectors
  Dock Side Fenders
  Fishing Boat Wear Plates
  Lobster Traps
  Pier Impact Protectors
  Rub Rails
  Sea Walls
  Trawler Net Rollers

GARDENING
  Compost Enclosures
  Fences, Gates
  Enclosures
  Garden Boundary
  Landscaping Timbers

RECREATIONAL
  Flower Pots
  Flower and Tree Boxes
  Golf Course Walk Ways
  Park Benches
  Picnic Tables
  Playground Equipment
  Sand Box Kits
  Stadium Seating
  Storage Bins

CIVIL ENGINEERING
  Barriers
  Bearing Pads
  Fences
  Road Delineators
  Traffic Direction Posts
  Retainer Walls

Markets for Recycled PET Products

CIVIL ENGINEERING
  Geotextile
  Urethane Foam

RECREATIONAL
  Skis
  Surfboards
  Sailboat Hulls

INDUSTRIAL
  Carpeting
  Fence Posts
  Fiberfill
  Fuel Pellets
  Industrial Paints
  Strapping
  Unsaturated Polyester
  Paint Brushes

Paper packaging vs. plastic packaging

In many cities across the U.S., city councils and community groups are trying to pass ordinances banning the use of polystyrene foam as a packaging material and replace it with coated paper. Based on research conducted by cities attempting to implement a plastic packaging ban, it appears that:

1) paper manufacturing emissions contribute more to acid rain, the greenhouse effect, and urban smog;

2) paper manufacturing has a higher energy consumption often requiring an on-site boiler system;

3) over 95 percent of polystyrene food packaging containers no longer contain CFCs and most cups never contained CFCs;

4) paper alternatives may cost more than polystyrene;

5) paper, polystyrene, and/or plastic alternatives may not reduce the volume and weight increases entering our landfill, unless efficient, economic and effective recycling programs are developed;

6) polystyrene may cause more visible pollution;

7) at this time, polystyrene is more likely to be recycled by private entities than plastic coated, aluminum-coated, or wax-coated paper products.

Markets for Recycled HDPE Products

AGRICULTURE
- Drain Pipes
- Pig and Calf Pens

MARINE ENGINEERING
- Boat Piers (lumber)

CIVIL ENGINEERING
- Building Products
- Curb Stops
- Pipe
- Signs
- Traffic-Barrier Cones

RECREATIONAL
- Toys

GARDENING
- Flower Pots
- Garden Furniture
- Golf Bag Liners
- Lumber

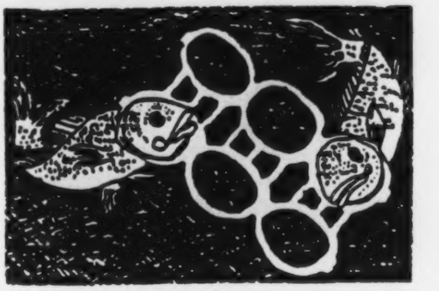
INDUSTRIAL
- Drums/Pails
- Kitchen Drain Boards
- Matting
- Milk Bottle Carriers
- Pallets
- Soft Drink Base Cups
- Trash Cans

TOTAL VOLUME
- 72 million pounds (1987)

Landfills: The myth of biodegradability

Modern landfills are designed to retard or limit the decomposition process of degradable materials, including food wastes. The microorganisms required for decomposition cannot easily live in the environment of a modern, sanitary landfill.

Dr. Riley Kinman, University of Cincinnati and Dr. William Rathje, University of Arizona, have conducted numerous pilot scale municipal landfill projects to evaluate the amount of degradation and decomposition of solid waste in landfills. Dr. Kinman and Dr. Rathje found 20 year old newspapers which have not degraded in landfills, and highly biodegradable products, such as bread and other food products, which also did not degrade over this time period. "Municipal garbage dumps do not decompose like the compost heaps in the backyards." Properly designed landfills which meet federal regulations do not allow the entry of enough water and light to allow much degradation.



Plastic and wildlife

The image of a gull strangled by a six-pack ring, or of a seaturtle choking on a plastic bag mistaken for a jellyfish, is a strong one. So is the picture of a sea lion wrapped hopelessly in discarded fish netting, or a small fish slowly being cut in half by a flip-top ring from a beverage container. The impact of garbage in our oceans and rivers is tragic. Animals are choking, strangling, drowning, or starving as a result of trash in the environment.

Annual beach clean-ups in Oregon, Washington, and the rest of the nation have shown a high percentage of plastics among the debris picked up along our shores. Recent research and analysis has shown that most of the plastic found is composed of non-degrading nets, bagging, straps and, in the case of foam (not food containers) from dock float materials and other structural uses of foam plastic in situations where they are subject to breaking, chipping, or otherwise dissolving into the water.

Strong efforts need to be made to address this source of plastic in the marine environment.

Packaging

To notice how foodstuffs are packaged.

Math, written language.

Field trip slips, ten pieces of paper and a pencil for each child, large chart paper.

We're going on a field trip to a supermarket. You will find 10 items and tell how they are wrapped. You may draw the packaging or write about it.

In the store, each child selects 10 items and draws, or writes about, how they are packaged.

Back in the classroom, each child shares his/her findings by reading or showing one of their pages. Have the class select 10 of the shared items and post them on large chart paper to hang in the room or hallway.

Why is there so much packaging?
Why do we use so much plastic?
Is it necessary?

POTATO CHIPS!
Sauce
DILL Weed
TEA
TOOTH BRUSH

Humpty-Du
Land o

A Report on the A
Educatio

By Marilyn Sigman
Alaska Department of Fish and Game

From her address to the Environmental Education Association of Oregon, November 4, 1989 in Sunriver, Oregon.

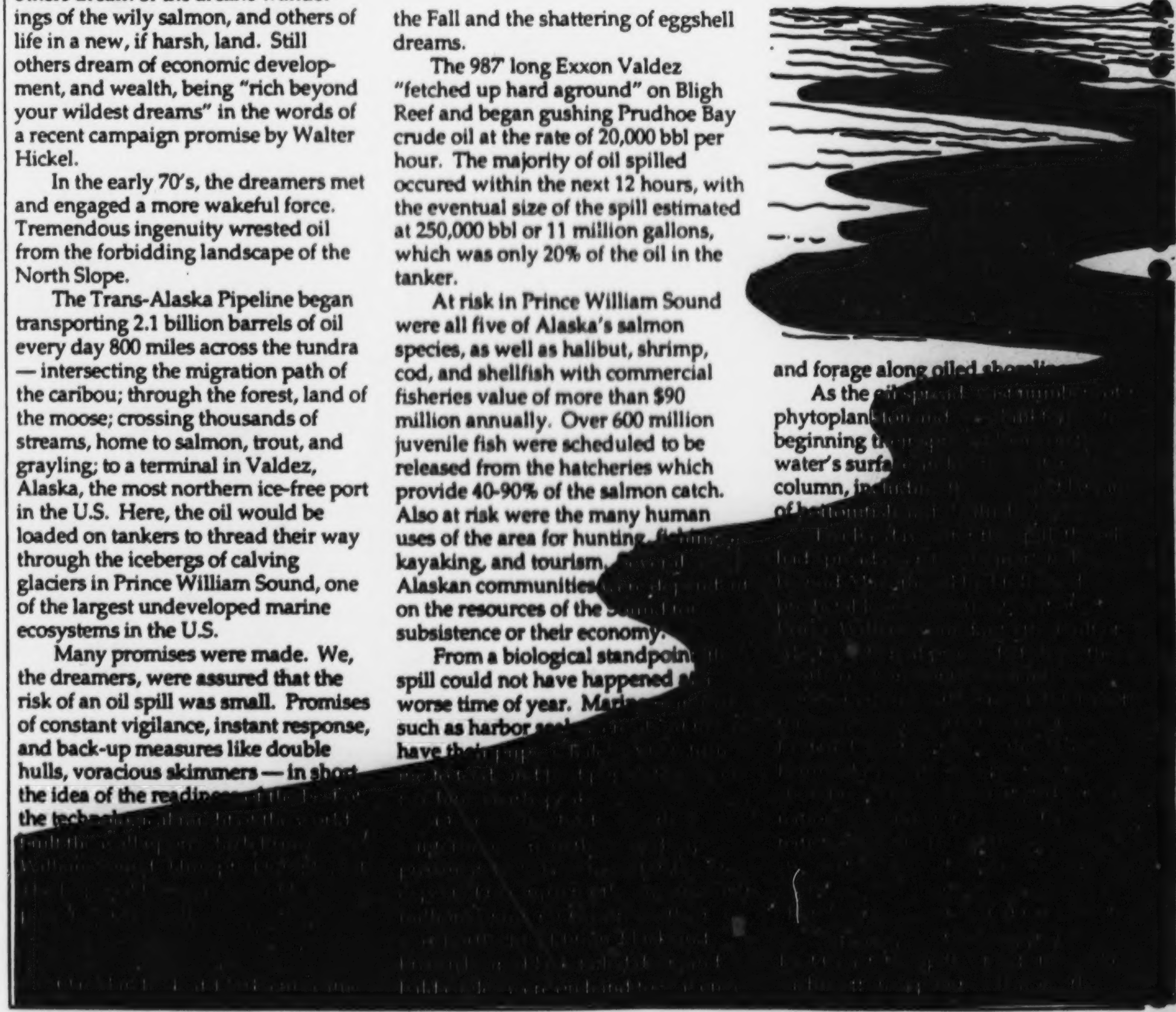
Alaska is a state of mind, a land of many dreams, where grizzly bears dream away the winter in dens on the top of the world.

Some human Alaskans dream of wild lands - unmarked by the imprint of the "mammal-in-a-hurry," while others dream of the arcane wanderings of the wily salmon, and others of life in a new, if harsh, land. Still others dream of economic development, and wealth, being "rich beyond your wildest dreams" in the words of a recent campaign promise by Walter Hickel.

In the early 70's, the dreamers met and engaged a more wakeful force. Tremendous ingenuity wrested oil from the forbidding landscape of the North Slope.

The Trans-Alaska Pipeline began transporting 2.1 billion barrels of oil every day 800 miles across the tundra — intersecting the migration path of the caribou; through the forest, land of the moose; crossing thousands of streams, home to salmon, trout, and grayling; to a terminal in Valdez, Alaska, the most northern ice-free port in the U.S. Here, the oil would be loaded on tankers to thread their way through the icebergs of calving glaciers in Prince William Sound, one of the largest undeveloped marine ecosystems in the U.S.

Many promises were made. We, the dreamers, were assured that the risk of an oil spill was small. Promises of constant vigilance, instant response, and back-up measures like double hulls, voracious skimmers — in short the idea of the readin [illegible] the tech [illegible]



the Fall and the shattering of eggshell dreams.

The 987' long Exxon Valdez "fetched up hard aground" on Bligh Reef and began gushing Prudhoe Bay crude oil at the rate of 20,000 bbl per hour. The majority of oil spilled occured within the next 12 hours, with the eventual size of the spill estimated at 250,000 bbl or 11 million gallons, which was only 20% of the oil in the tanker.

At risk in Prince William Sound were all five of Alaska's salmon species, as well as halibut, shrimp, cod, and shellfish with commercial fisheries value of more than $90 million annually. Over 600 million juvenile fish were scheduled to be released from the hatcheries which provide 40-90% of the salmon catch. Also at risk were the many human uses of the area for hunting, [illegible] kayaking, and tourism. [illegible] Alaskan communities [illegible] on the resources of the [illegible] subsistence or their economy. [illegible]

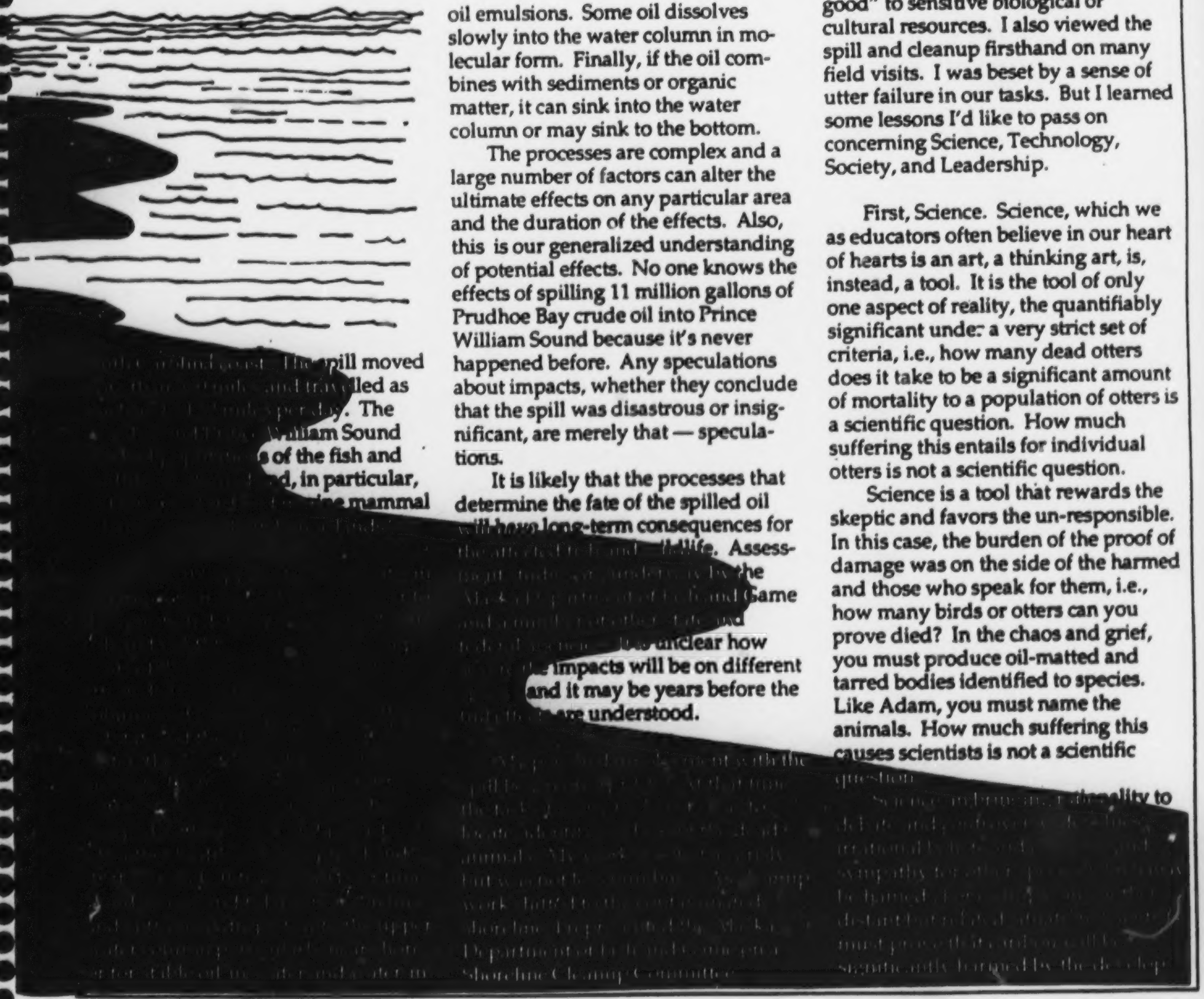
From a biological standpoin[illegible] spill could not have happened [illegible] worse time of year. Mar[illegible] such as harbor [illegible] have th[illegible]

and forage along oiled [illegible]

As the [illegible] phytoplan[illegible] beginning t[illegible] water's surfa[illegible] column, i[illegible] of [illegible]

npty and the Dreams:

ka Oil Spill and the Response



[illegible] The spill moved [illegible] travelled as [illegible] per day. The [illegible] William Sound [illegible] s of the fish and [illegible] d, in particular, [illegible] mammal [illegible]

oil emulsions. Some oil dissolves slowly into the water column in molecular form. Finally, if the oil combines with sediments or organic matter, it can sink into the water column or may sink to the bottom.

The processes are complex and a large number of factors can alter the ultimate effects on any particular area and the duration of the effects. Also, this is our generalized understanding of potential effects. No one knows the effects of spilling 11 million gallons of Prudhoe Bay crude oil into Prince William Sound because it's never happened before. Any speculations about impacts, whether they conclude that the spill was disastrous or insignificant, are merely that — speculations.

It is likely that the processes that determine the fate of the spilled oil will have long-term consequences for [illegible] wildlife. Assess[illegible] the [illegible] Game [illegible] unclear how [illegible] impacts will be on different [illegible] and it may be years before the [illegible] are understood.

[illegible] with the [illegible]

attending daily to meetings with a diverse group of individuals representing Exxon, Native landowners and communities, and local groups. The existing technologies for cleanup, we learned, were woefully few and often required prolonged and intense human activity involving noise, disturbance to wildlife, and the application of hot water often under pressure and chemicals to intertidal areas. Our task, as we reviewed the cleanup plan for every beach in Prince William Sound, was to recommend the most appropriate clean-up techniques that would be A) effective and B) would not cause "more harm than good" to sensitive biological or cultural resources. I also viewed the spill and cleanup firsthand on many field visits. I was beset by a sense of utter failure in our tasks. But I learned some lessons I'd like to pass on concerning Science, Technology, Society, and Leadership.

First, Science. Science, which we as educators often believe in our heart of hearts is an art, a thinking art, is, instead, a tool. It is the tool of only one aspect of reality, the quantifiably significant under a very strict set of criteria, i.e., how many dead otters does it take to be a significant amount of mortality to a population of otters is a scientific question. How much suffering this entails for individual otters is not a scientific question.

Science is a tool that rewards the skeptic and favors the un-responsible. In this case, the burden of the proof of damage was on the side of the harmed and those who speak for them, i.e., how many birds or otters can you prove died? In the chaos and grief, you must produce oil-matted and tarred bodies identified to species. Like Adam, you must name the animals. How much suffering this causes scientists is not a scientific question.

Science [illegible] rationality to [illegible]

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ment of oil in the Arctic National Wildlife Refuge.

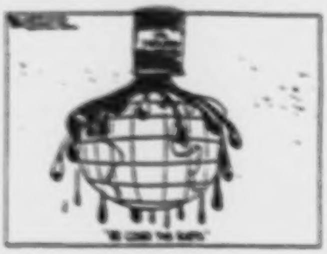
At best, science is a narrow beam in the murk of comprehending the interdependence of living things and the environment. We need to use scientific processes to make a realistic appraisal of the situation, but we cannot be blind to the limitations of science as an "appropriate" mode of response.

Next, technology. We had the spectacle of an oil industry which has displayed engineering genius in transporting oil 800 miles in a system that translates cold and heat in a way that rivals the intricacies of the flipper of a fur seal. Yet, when spilled oil reached the beaches, they basically threw up their hands and asked public agencies what they should do. They deployed workers to begin washing deeply-oiled beaches with cold water, a technique which housewives have found to be unsucucessful on thin coatings of rease of frying pans. When ordered by a Coast Guard Admiral, they switched to hot water. On their own initiative, they created a demon machine, the Omni-boom, that sprayed 140 F water at high pressure out of an extendable, articulated 200-foot arm. They began operating the machines 24 hours a day, floodlighting the formerly remote shores, sometimes mowing down the unoiled intertidal community and causing massive erosion. I believe the net effect of these washing techniques was to move oil off the top layers of beaches into the water where only a portion of it could be retrieved.

Later in the summer, Exxon wanted to use dispersants, i.e., soap, which they manufactured themselves. Yet, they balked at testing its toxicity which might add insult to injury in nearshore habitats. The EPA, with Exxon funding, developed a famine relief program for "bugs," which, nourished by missing nitrogen, will hopefully eat their way through the offensive muck until gagged by asphalt. At the end of their effort, while some of the rocks on the tops of beaches were noticeably "cleaner," especially when viewed from 1,000 feet above; black, toxic oil remained in crevices and in deeper beach layers 2-3 feet thick, where it will likely continue its leach into nearshore waters.

"Cleaning the beaches" was translated into an assault of 10,000 people and 2,000 vessels in a formerly remote and wild area with organization as elusive as their goal.

The greatest lesson concerning oil spill cleanup technology is that once the oil is spilled, all the decisions are agonizing ones between terrible alternatives: now that the toe is gone, shall we gamble on poisoning the whole foot or the leg? Once oil is on 700 miles of beach, cleanup requires an army, or at least a navy and Coast Guard and part of the battle is already lost. Cleaning up spilled oil produces oily waste and a technology of oily waste disposal — burn it and you may produce dioxins, send it to someone else's backyard — in this case, it was Oregon's, or send it on a strange round-trip that evolved in Prince William Sound to truck oily waste from Valdez to Prudhoe Bay to be



Oil Education Resources

According to an article in *Flyways, Pathways and Waterways* - the newsletter of the Alaska Natural Resource and Outdoor Education Association (ANROE) and NAME - a group of educators are working to develop educational materials to assist people worldwide in understanding the oil spill and to develop a positive attitude and relationship with the earth.

Their top priority is an "Oil Spill Education Packet," which will include a teacher guide, video, cassette tape, vial of oil, absorbent material, and other written material. The curriculum will be interdisciplinary and hands-on and will include a variety of points of view appropriate to the school setting. The materials will include an action component, so that students can follow through on their research. A brief selection of other materials available include:

Publications

Prince William Sound Environmental Reader: 1989 Exxon Valdez Oil Spill, Prince William Sound Conservation Alliance, P.o. Box 1697, Valdez, AK 99686. Good account of the fate of oil in the marine environment. $9.95

Alaska Fish and Game Magazine, July/August 1989. Special Oil Spill Issue, ADFG, Box 3-2000, Juneau, AK 99802. $2.00

Videos

Voices of the Sound
Twenty minute production available for $20 from the Cordova District Fisherman United, Cordova, Alaska, 99574 (907) 424-3447.

America's Largest Oil Spill
Fifty minute video produced by Anchorage Channel 2 KTUU available from Alaska Video Publishing, Inc. Phone in Alaska 563-3343, outside 800-248-9453.

Magazine Articles

-Two different viewpoints on the spill impacts (good for discussion of bias and critical thinking skills)

"The Disaster That Wasn't" - U.S. News and World Report, September 18, 1989.

"What Exxon Leaves Behind" and *"In Alaska, The Future is Now,"* - Newsweek, September 18, 1989.

"State/Federal Natural Resource Damage Assessment Plan for the Exxon Valdez Oil Spill" Public review draft, 1989. Check with federal agencies: USFS, USFWS, NOAA, or EPA. Good introductory section on PWS resources and potential impacts, followed by summaries of all impact assessment studies.

National Wildlife, Special Article on the Oil Spill plus Conservation Alert, Alaska Wildlife Federation, Alaska Natural Resources Center, 750 West 2nd Ave., Suite 200, Anchorage, AK 99501.

Curricula

Oil Spill Curricula
The Department of Education sponsored an oil spill Talkback program on the Alaska Rural Television Network on May 18, 1989. In preparation for this program the department produced background materials for students. Included in the material is information on teaching controversial subjects, student activities and resource information. Although the materials were produced for one-time use last spring, a limited supply of copies are available from Peggy Cowan, Alaska Department of Education, P.O. Box F, Juneau, AK 99811 (907) 465-2841.

incinerated in the shadow of the source of the pipeline system.

Next, society. Our society responded to the spill with outpourings of grief, of sympathy, and herculean efforts and herculean bureaucracy. But we also helped created the conditions that made the spill inevitable. For perspective, 25% of all the oil used in this country travels through the Trans-Alaska Pipeline. Society, that's us — me and you, who fly thousands of miles to a conference to discuss the environment — who sometimes escape from the pressures of saving the world by driving somewhere "to get away from it all." A society which may have expended as much petroleum in the fuel, sorbents, polypropylene underwear, and some 157,000 sets of rain gear in trying to clean up the spill as will be recovered. Another sobering statistic is the 530 miles of toilet paper used during the cleanup.

So who do we blame? We have already tried to blame Exxon for incurring the risk of what occurred, to blame the State of Alaska for being an underfunded and politically-pressured policeman, to blame all Alaskans for being "on the take" from the oil industry as a whole before the spill and during the cleanup. But, really, the buck stops here, with your or my next decision to drive or to walk, to use an extra plastic bag, etc., etc., etc. I won't waste your time preaching to the choir, rather I'll point out one very positive thing that followed grief and blame — a sense of rededication for many Alaskans. We learned that individual actions do matter, because the alternatives are too grim to bear. Although it feels increasingly like maybe, somewhere, somehow, America substituted plastic for a part of its soul, perhaps we can reclaim life without the "amentities" that brought us to revile one possibly drunk Supertanker captain and a part of ourselves.

Beyond grief and blame, we are still left with a sense of loss. How will it be possible to compensate for this loss? Society is driven by economics, but the loss that has occurred to a Cordova fisherman or a tidepool walker is only one part dollars and cents. A recent court ruling overturns a Reagan-esque plan to require a dollars-and-cents payment for each dead animal (e.g., $15 per habor seal) and changes it to the need to pay the full cost of restoration, but even this is inadequate to the reality. Beyond the concept of wilderness is a concept of the Whole, of Humpty-Dumpty back together again, the pristine, productive, and diverse ecosystem. Much of what has been lost, the least of which is Alaska's innocence, will never be regained.

Finally, **Leadership**. Educators have a critical role to play in the modeling and development of leaders. The spill response has demonstrated the best and worst of leadership. In the early response, the courage and visibility of Governor Cowper and Commissioner Kelso of the Alaska Department of Environmental Conservation were essential to the people of Alaska. Chaos and tragedy were the perceptible ground against which these figures were visible; their absence would have deepened grief into despair and hopelessness. Adminral Clyde Robbins, who oversaw the cleanup, was both decisive and sensitive to often conflicting concerns. Meanwhile, our representatives in Congress voted against double hulls for the future and our President never even visited the scene, concerned about the political "spin" involved six months after the spill. However, perhaps the most heartening leadership of all came from the many fishermen and residents of the small communities that rose immediately to the occasion and labored around the clock. They made the large difference in a situation where the tremendous resources of a multinational corporation remained untapped.

One of the clear lessons of the spill was the need to develop leaders through reinforcing the leadership skills we all possess. Communities emerged bruised, but united, as they fought for their environment and their dreams. They are continuing to fight for better oil spill legislation, and better contingency planning. Alaskans are beginning to examine their Faustian bargain with Big Oil and hopefully, we can renegotiate some of the terms.

We need to train citizens to respond, to understand natural systems as best humans can, in order to do whatever it is humans can do to reestablish and rehabilitate and restore. Conservation battles will continue, but so, too, will the challenges of on-going assaults to noble warrior Earth, which has been wounded and healed itself many times, in a war that it never declared. We must become and train warriors of salvage and restoration, in battles for the integrity of the Earth. We won't get another planet; the challenge is ours to keep this one liveable for all species.

Balance and Bias in Environmental Education

by Roger Hammill
President, Environmental Educators' Provincial Specialist Association

Everyone is biased. We all have a particular point of view that colors our perceptions, thoughts, words and actions. Of itself, this is not a bad thing. Industries and government agencies attempt to win support for their positions through various means. Traditionally, this has been done through advertising in various media, written or verbal presentation (lobbying), or through various forms of publications. Increasingly, an important technique to win public support has been the production of curricular materials ranging from background information to complete programs. Usually, this material is well written, attractively packaged, effectively inserviced, and best of all, free!

Examples include materials from such organizations and industries as the Council of Forest Industries (COFI), BC Hydro, Atomic Energy of Canada, Cominco or McMillan-Bloedel or government agencies such as the Department of Fisheries and Oceans or the Minstry of Environment. Many teachers recognize that these industries are attempting to put across a particular position and use such materials with caution. However, often the material is so well presented that the bias is often extremely difficult to perceive. The bias can be in what is included but, more importantly because it is so difficult to detect, what is excluded.

For example, the FOREM material developed by COFI gives the appearance of a balanced viewpoint by emphasizing multiple use of the forest resource - forestry, recreation, wildlife or agriculture. But think about this - why should forests be called a resource at all? In accepting this term, we also "buy into" the important concept that forests are resources to be used in various way. We are automatically limited in our choices by the terms "use" and "resource." The concept that a forest is valuable just because it is there doesn't qualify as one of the choices and therefore, usually ignored. The patterns of thought prevalent in the organization, in this case COFI, are reflected in both what is included in and excluded from the material produced under their auspices.

Does this mean that teachers must not use industry-produced materials? Are materials produced by governments or by the environmental advocacy organizations the only ones that are "safe" to use? Not so - all organizations and individuals have biases.

For example, teachers might make use of Ministry of Environment materials for a wildlife unit. Factual and fair? Factual certainly, but the materials are often produced by the wildlife management branch. The bias is illustrated by the name of the organization. Animals which are not managed are not mentioned and again, the teacher is subtly drawn into the debate on the economic values associated with a particular species. What impression is left with children. Are there only large mammals in BC? Do animals need to be managed? Do animals exist only for the various benefits that can accrue to man? Are animals that compete with man automatically pests to be controlled by various means?

Certainly, most government material takes a less exploiting stance, but nonetheless, the biases are there all the same. For example, do streams exist for their inherent value or as habitat for salmon? Are there really no alternatives to building more dams?

Are the materials such as Project WILD, developed by wildlife organizations through the efforts of many respected educators unbiased? That depends upon your viewpoint. Several humane societies complain that Project WILD is definitely slanted toward wildlife management.

Grizzly & cubs
17 JUL 88
D.N.P.P., AK

Well, how about materials produced by such **environmental advocacy groups** such as the Society Promoting Environmental Conservation (SPEC), Greenpeace, Western Canada Wilderness Committee (WCWC) or the Sierra Club. Are they unbiased? Certainly not. These organizations are actively promoting a particular orientation to the world and are as guilty as any of ignoring facts which would tend to soften their case.

Does this mean that teachers cannot use any of the excellent resource materials on environmental education? Not at all. Used well, these resources can be the basis for some of the most productive activities promoting **critical thinking and decision-making skills** that you can imagine. It is these skills that will serve the educated citizens of tomorrow, not the few scraps of unrelated facts that still rattle around in their (and our) skulls.

All through life, humans must make decisions that can have a profound effect upon both their life and the lives of everyone around them. Being able to select from the myriad choices available, and to arrive at a reasonable and responsible decision is the mark of a truly educated citizen. **As environmental degradation worsens, the choices become fewer and the consequences more critical.** Do we need to reduce or eliminate logging? Is nuclear energy our best option to replace fossil fuels? How can we stop destruction of the Amazon rainforest? Do we have the right to impose our values on the Third World? Our students will be faced with these and many more critical issues. How can be equip them with the skills to handle them?

The key idea is balance. Instead of just using one resource with its single point of view, provide another resource that takes an opposite attitude. For example, if you are going to use the excellent FOREM modules or similar material for a forestry unit, also obtain as much information from organizations such as WCWC that oppose current logging practices. This will have several advantages. Viewpoints will be balanced. **Students will learn to look beyond the glossy pictures and skillful presentation to the underlying biases, to examine motives, and to carefully analyze their own thoughts.** By forcing students to examine arguments carefully and to defend choices, valuable critical thinking and decision-making skills will be reinforced.

Several teaching techniques can be used. Provide students, either individually or in groups with printed copies of materials representing **as many viewpoints** as you can and ask them to examine them. The videotape produced by McMillan-Bloedel advocating logging in the Carmanah Valley can be balanced with one produced by WCWC arguing for preservation of the ancient forest. Speakers from opposing organizations might be asked to address the class on separate occasions. Two separate student groups might be asked to write up a presentation of each viewpoint and then debate the issues. Role-playing possibilities abound. Just never present students with one opinion on these critical issues.

As the environmental debate heats up (along with the atmosphere), the more organizations will attempt to use the schools as a forum for getting their message across. Unless teachers remember the key ideas, bias and balance, then schools will become a **battleground** for public attention and students will become just another target group for a media campaign.

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Environmental Lifestyle Summary

by Ross McCluney

Alexander Solzhenitsyn recently said that humanity is at a watershed, when life's noblest lights have been dimmed and advance is possible only by some form of spiritual renewal. "We shall have to rise to a new height of vision, to a new level of life, where our physical nature will not be cursed, as in the Middle Ages, but even more importantly, where our spiritual being will not be trampled upon, as in the modern era."

"We have placed too much hope in politics and social reforms, only to find out that we were being deprived of our most precious possession: our spiritual life. It is trampled by the party mob in the East, by the commercial one in the West."

What Solzhenitsyn is talking about is this. Our society now finds itself on a course that, if unaltered, can only lead to self-destruction. We have reached a turning point and we have only a short while left to decide if we are going to change our direction. If we do not make the needed changes soon, it may be too late, for irreversible damage will be done to our life support systems — and to the human spirit.

Doom-sayers have existed throughout recorded history. Few of their dire predictions have come to pass, and we take the new ones with a grain of salt. Our current set of crises, however, is both qualitatively and quantitatively different from anything society has ever experienced in the past. The special importance of these crises is being expressed by a lage number of scientists, scholars, planners, and government leaders. They base their concerns upon an extensive collection of had facts — data and information collected by scientists, economists, psychologists, sociologists, government statisticians and others that we cannot dismiss lightly.

Each year symptoms of self-destruction are more pervasive, severe, and evident nearly everywhere.

The way we now organize our society is incompatible with the way nature works. We seem not to know the consequences of our actions. One reason is the growing technologically-based separation of the individual from knowledge and experience of thos consequences. Waste products of all kinds are taken out of sight and out of mind by a complex and impersonal system. In our food and energy systems, we are totally ignorant of the environmental devastation our purchases can produce. It is no wonder that we all wonder that's the problem and don't see ourselves at the heart of it.

> **It seems to me that the earth may be borrowed but not bought. It may be used but not owned. It gives itself in response to love and tending, offers its seasonal flowering and fruiting. But we are tenants and not masters. The earth belongs to the wind and the rain, to the sun and the seasons, to the cosmic secrecy of seed, and beyond all, to time.**
>
> -Marjorie Kinnan Rawlings, *Cross Creek*

There is an understandable reluctance on the part of most people to do anything about these problems. Life is difficult enough as it is, with rampant inflation, unemployment, overly busy daily schedules, and extensive responsibilities to the presumed (and real) needs of children and family. With all this, who has the time and energy to pursue such seemingly difficult and illusive problems?

The problems themselves seem to be so huge and insurmountable to the individual that the natural response is a belief that ordinary individuals are powerless to do anything about them.

There are many things that ordinary individuals can do, however, to deal with these problems. The most important, in my view, is to look very closely at our own individual lifestyles and try to discover the ways in which we ourselves contribute to the problems.

U.S. society is presently organized around an inherently wasteful and destructive system of misplaced values, a system which depletes our physical and human resources and turns us competitively against each other. The situation is so pervasive that to be an ordinary or "normal" person is to be completely wrapped up in a socally and environmentally destructive lifestyle.

For many people the alternative appears to be frightening. Our quality of life is so involved in material pursuits that we fear a loss of all we hold dear if we are forced to give up our destructive lifestyles.

The message I offer, however, is that these fears are largely unfounded. If people are asked what they really gain from their material goals, and if the question is asked repeatedly, eventually people get at the heart of what they expect material luxuries and possessions to provide them. Invariably it is some non-material quality or feeling that turns them on. Once they begin to see this they are more receptive to finding other, less destructive ways to obtain what they want.

Putting it this way we can begin to see the direct and personal benefits of a more environmentally and socailly sane way of living. Energy efficient automobiles, houses, offices, and appliances save us more. Reducing our solid wastes makes our waste removal chores less burdensome. Less violence at home eases our emotional burdens and makes it easier to live at peace with ourselves.

Opportunities surround us for strengthening our recreational, emotional, spiritual, and ethical values and enjoying life more in the process. Once we discover this new path to life, we begin to see an environmentally saner lifestyle as a very desireable alternative, one toward which we are drawn quite naturally, without coercion or outside influence.

All it takes is a willingness to ask a few questions and a relaxed willingness to accept the answers and their implications for us personally.

The beauty of this approach is htat it can lead to permanent lifestyle changes. Changes made under duress, half-heartedly, or out of a sense of guilt or obligation are not as satisfying and seldom last. Changes that are viewed as desirable, as leading to a definite and meaningful improvement in the quality of life are more likely to be taken seriously and made permanent.

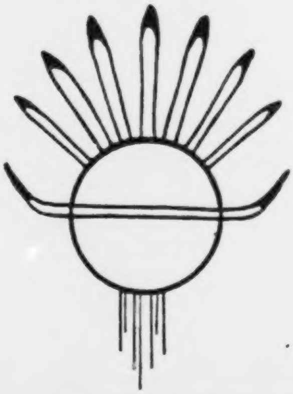
Although there are a number of valuable and worthwhile organizations fighting our global problems organizations that need to be supported, and in spite of the related need for effective political action, I have found that to begin at the heart of the problem I must begin with myself. I am the only person I can hope to chage and probably the only one I really have the right to change. The beauty of this is that it frees me of any need to tell other people what they "ought" to do (and running the risk of misinforming them in the process) and it allows me to offer only information and shared experiences, essentially on request.

I encourage you to join me in this process of self-discovery through environmental and social reform at the personal level. The goal is an increased enjoyment of and satisfaction with life, a greater sense of personal relevance, and a safe place for our children and their children to grow.

-Ross McCluney is an educator living in Boca Ratan, Florida. □

We should all be concerned about the future because we will have to spend the rest of our lives here.
-Charles Franklin Kettering

Native American Oral Tradition in Environmental Education: Inspiring a Land Ethic



Clayton T. Russell
University of Montana
Missoula, Montana

Many environmental education programs, as well as school science programs, emphasize the teaching of information about the environment. The attention to details and to fcts has the effect of keeping students at arm's length from nature by occupying their time with measuring and counting. During the ten year period, 1975-1985, in which I taught environmental education, I found myself doing fewer and fewer traditional measuring activities while incorporating more and more holistic and experiential activities into the curriculum Many of these activities drew upon stories from the Native American oral tradition.

While we were directing our educational effort towards understanding the workings of the environment, we had failed, and are still failing, to introduce to our students an understanding of their being involved as a part of those workings. We have largely overlooked the importance of our relationship to nature, our sense of participating in it or as Aldo Leopold (1949) said our being a "citizen with the land community." It seemed that this feeling or sense of a relationship with nature, a human-to-land ethic, could best be introduced using literature from the Native American cultures. Their rich and diverse traditions have developed within the community of nature for thousands of years, and continue to do so. At the time of European contact, there were over 2,000 cultural groups exhibiting a wide diversity of customs and lifestyles, a plethora of values, beliefs and languages. It is from these dynamic cultures that a clear voice concerning an experience with the land has been coming into environmental education as well as modern environmental writing. The message of long term survival with the land comes from a diverse groups of people who have lived for generations close to the earth with a "metaphysic of nature" as described by Brown (1985). It was their words, more so than any others, that were having a noticeable impact upon my students.

Most environmental issues are issues regarding our long term survival. The message in oral traditions is carried by a voice that has had great experience living with the land over the long term and has in turn been influenced by it. It is likely that the Native American voice we hear speaking for the land is the voice of the land itself. With regard to our long-term survival, an understanding of the Native American human-to-land ethic would benefit us all. By exposing ourselves and our students to ideas from other cultures, we can compare and contrast the Native American ideas with our own. This juxtaposition may act to broaden our understandings of diverse cultures as well as suggesting some ideas for improving our own human-to-land ethic and our long-term survivability.

In our search for a relearning of place within the natural community, we can also infcorporate other lessons from the oral tradition. The literature's complexity or simplicity, thoughtfulness, rich description and humor are a part of the message for the ever wondering human. We must also exercise caution when using these stories so that we do not sacrifice a more complete understanding of the Native American lifestyle simply for our own benefit. For if we happen to better understand our place in Nature's community because of their teaching — we will owe them a great debt.

Within the context of the oral tradition one can "hear" the native peoples speak for themselves. By looking closely at the Native American human-to-land ethic, their dynamic and reciprocal relationship with nature and the proper role of humans as citizens of nature, as taught through the oral tradition, we can learn both about and from the Native American cultures. We can see and feel in the literature a close and morally responsible relationship with all components of the natural world.

I would encourage educators to share with their students stories from the Native American Oral Tradition. From these stories we can glimpse the many layers of meaning and relationship demonstrated by the oral literature. Astrov (1946) explains how the many skills of a storyteller contribute to a feelingful telling of the story and a more effective conveyance of the messages therein. Lopez (1978) describes the verbal art of storytelling as a way to reproduce the exterior harmony of the land in the individual's interior.

The Native American Oral Tradition demonstrates to young people that there is a value in opening ourselves and our senses to nature, and in being able to frequent the wild places and spaces in order to be influenced by such teachers as the animals, rocks, thunderstorms, silences, sunsets and vistas. Through the use of Native

American oral literature, environmental educators can rekindle imagination, inspiration and interest in a relationship with nature. The collective wisdom from the Native American sources tells us that we must, again, be respectfully conversant with the land if we are to continue to live on this earth.

-From the proceedings of the 1989 Conference of the North American Association for Environmental Education.

If you are a parent who feels he has little nature lore at your disposal there is still much you can do for your child. With him, wherever you are and whatever your resources, you can still look up at the sky - its dawn and twilight beauties, its moving clouds, its stars by night. You can listen to the wind, whether it blows with majestic voice through a forest or sings a many-voiced chorus around the eaves of your house or the corners of your apartment building, and in the listening, you can gain magical release for your thoughts. You can still feel the rain on your face and think of its long journey, its many transmutations, from sea to air to earth. And with your child you can ponder the mystery of a growing seed, even if it be only one planet in a pot of earth in the kitchen window.

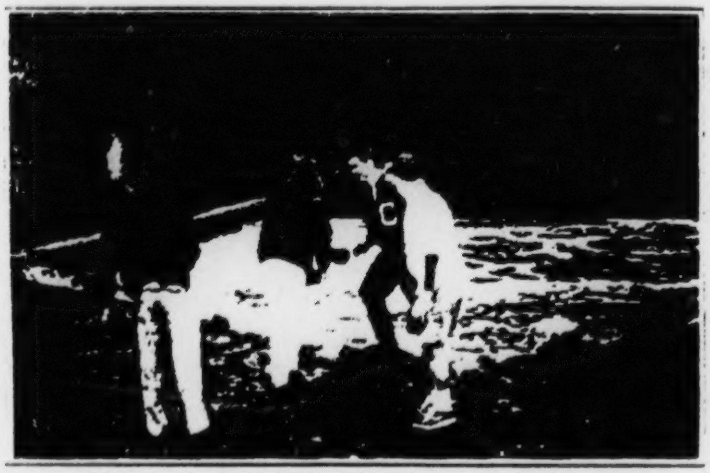
-Rachel Carson

Environmental Education
in the Pacific Northwest

Exemplary EE Programs

Rogue River Eco-system Project
Crater High School
Central Point, Oregon

by Hans Smith



Crater High School's Rogue Ecosystems Projects, now in its second year, has three goals for its student members: to promote an understanding of Southern Oregon's Rogue Basin ecosystems, to analyze issues involving man's place in it, and to take action to improve the system itself.

This year the class has been actively working toward these ends. Early this fall, students and community members took on a stream habitat improvement project, putting in an upstream V-log weir into Bear Creek, adjacent to the project's salmon and steelhead hatching site. The creek is a tributary of the Rogue River and its improvement has become a major issue in Southern Oregon, due in part to the progress being made in Jackson County's Bear Creek Greenway Project.

Students have also been creating a series of environmental activities for area elementary children. After a workshop is held with elementary teachers, the students will begin conducting the activities for thirteen 6th grade classes in April. They will be helped by the project's mascot, Bear Creek Bob, who will give a historical perspective of man and nature in the Rogue Valley. The three hour sessions will be held at both the school district's eco-lab on Bear Creek and a local pond.

The students are also producing a video about Bear Creek, past, present and future, centering on a proposal for finishing the Greenway Project. It is being written and directed by the students with some community help and will include original music.

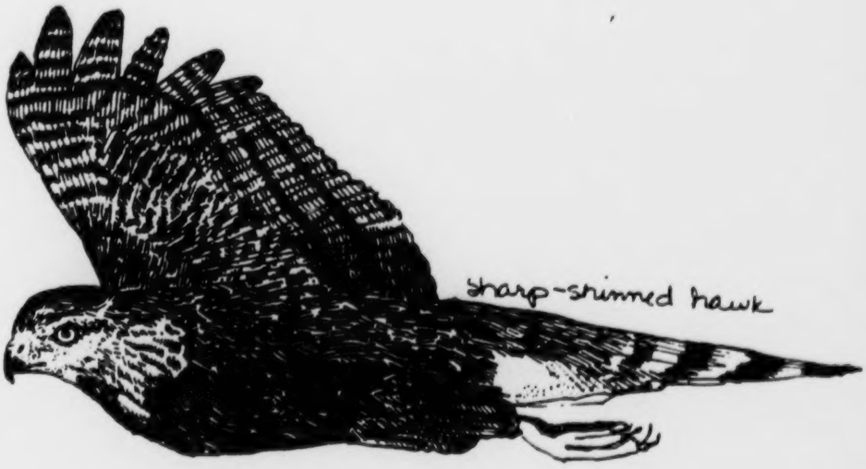
Other activities underway are wood duck and floating next box programs and further stream enhancement projects including a bank protection site as well as placing boulder clusters.

On the horizon are an organized K-12 environmental program including agriculture and horticulture, construction of a classroom/visitor center with surrounding nature and agricultural trails plas a bridge to view salmon spawning, and working with other schools in Southern Oregon to promote similar projects, all stressing students taking action to improve their local eco-systems.

A long-term goal is the creation of a Rogue EcoPark, a visitor center with dioramas depicting man and nature in Rogue Valley, constructed at the creek-side site. It would be designed, constructed, and operated by students, perhaps as a part of the county, state or national parks system.

The project has been funded by grants from the Oregon Community Foundation, the Oregon Parks Foundation and the Oregon Education Association. Many individuals and organizations in the community have also lent their time, expertise and equipment. Further funding is being sought to continue and expand the project.

For more information on this program, contact Hans Smith at Crater High School, 4410 Rogue Valley Blvd., Central Point, OR 97502; (503) 664-6611, ex. 220. ☐



Earth Day 1990:

Connecting with Nature

By Michael J. Cohen

Earth Day, April 22, 1970 found me visiting Dixie State College in St. George, Utah, some thirty miles south of Zion National Park. Devoid of graffiti, the College looked like the 60's never happened; students and faculty sported the outlooks of the fifties or perhaps were decades ahead of the world, couched in Reagan era styles and thoughts.

On that first of all Earth Days, the rallying Dixie College faculty and students cheered an authority who claimed that "The energy used by all the hair dryers in the United States equals the total energy output of the Nuclear Power industry. If we stop using hair blowers, we can stop Nukes and their radioactive pollution," he said. Another leader offered facts and figures showing monumental environmental and social gains if the public merely ceased eating meat. Again applause shook the auditorium.

I was neither student nor faculty at Dixie College. My presence there was a geographic circumstance. St. George was where my travelling environmental school - "Our Classroom Is Wild America" - had come to use a library and do laundry. The laundry was urgent after our three day backpack above Zion's Great West Canyon and a muddy, freezing trudge through the awesome Narrows of the snow melt Virgin River.

The Dixie College Earth-rally participants soon discovered my school's presence there and our year long commitment to environmentally and socially responsible hands-on education. We received a round of applause, being hailed as pioneers in what education should be.

And today? Today our society more intensely than ever thrives on hair blowers, meat and traditional classrooms, accompanied by soaring pollution, violence, acid rain, crime, toxic waste, armament, teenage suicide, habitat loss, water shortages, child abuse, rain forest depletion, radioactive waste, rape, species extinction, ad nauseum. We are environmentally aware but behaviorally destructive. Our culture's bias makes our awareness miss the point.

The point is that our problems are unique to modern civilization. They don't exist in Nature or in nature-bonded peoples.

Sometime, somewhere in the ancient past, modern society disconnected from the wisdoms of the natural world. We replaced our bonding to Nature's ways with our society's laws. Today, that replacement separates modern people from Nature's balancing energies, energies which prevent any single species from running amuck.

Detached from Nature's harmonics, modern society strays uncontrollably. It is as if we invented a car without brakes. Our global and personal problems result from the difference between the way Nature works and the way modern thinking programs each new generation.

Since 1970, while constantly living outdoors throughout the seasons, I have slowly come to realize that I was brought up insensitive to the natural world. My early upbringing civilized me and modern civilization is at war with Nature.

Living in Nature, I find that bonding with the natural world, not band-aid technology creates civilized, environmentally sound stability. For example, without bonding:

- many of us who formally elected to drive energy-efficient, minimally polluting cars, today once again drive excessive gas guzzlers;
- lower oil prices have nullified our desire for solar energy;
- each of us remains a guinea pig for thousands of untested chemicals which disrupt Nature's balanced way;
- the energy we conserve today we fritter away on some new technology tomorrow;
- the environmental battles we win we must fight over and over again;
- chemicals become dependencies for artificially inducing Nature's peace into our lives;
- the natural bonds holding individuals, families and species together have broken asunder;
- our warped prejudice against

> Nature applauds our conquest and management of the natural world. We're trashing Alaska now as we trashed the wilderness a century ago.

Overwhelmingly, studies show that most people feel horrible about our destructive impact on Nature and each other. But the state of the Earth shows that without bonding to the natural world environmentally, people are unable to act off how they feel. Unlike our emotional bonding to our money, religion and name, without bonding to Nature, sound long-term social and environmental realtionships escape us.

Bonding to Nature inhibits excessive exploitation of the natural world and people. It is a vital ingredient for responsible living.

There are new, potent nature activities which catalyze bonding. They consist of sensitizing ethics, role plays, writings, exposures, transferences, projections, exercises, analyses, poems, imageries, games, postures, personifications, reinforcements, meditations, songs, readings and thoughts. In natural settings, these activities connect people with Nature. They bond people to Earth because the connections feel good. The activities let Earth teach. They also empower people to more healthfully structure their lives around the following facts, many of which have come to light since that first Earth Day:

1. Giving people information by itself does not change behavior. Most people who actively care for Nature gain that senstivity from feelingful contact with the natural world, not from isolated classrooms or teachings.

2. In order to be part of the global life system, or any system, any entity - including a person - must be in communication with the system, otherwise that entity destructively may go its separate way from or through the system.

3. Planet Earth acts like a living organism. In concert the global life community organizes, perpetuates and regenerates itself by generating at least 53 tension and relaxation relationships. People and other sentient beings experience Earth's tensions as hunger, self, thirst, color, moods, sound, trust, touch, suffocation, place, nurturing, excretion, reason, community, etc.

4. Sensations and feelings are facts; there is a large body of feeling behind our every thought and action. Neither scientists, religious figures nor politicians invented sensation and feeling. Nature did. They are Nature. Without feelings we'd each be lifeless machines or formulas.

5. Nature is Earth's intelligence in action. It is a shared global survival wisdom which with training, modern people can sense as a felt logic.

6. Nature is illiterate. Natural survival tensions and senses, not language, delicately balance Earth's life communities locally and globally, sub-atomically and climatically. Unlike indigenous peoples, modern people learn to subdue, not culture their inborn senses. But our senses are Nature, a seamless living continuum of which we are part.

7. In order for humans to be integral members of the global life community, each natural sense connects Nature within us to the natural world surrounding us. For example, thirst and excretion feelings enable us to share Earth's waters in mutually beneficial ways. Similarly, hunger and excretion feelings connect us to minerals and energy; suffocation sensations connect us to the atmosphere, as we breath air, the global life community breathes us. Each of our 53 or more senses contribute to maintaining personal and global balance.

8. Average Americans spend most of thier lives using only four senses: rationality, language symbols, sight and sound. By ignoring our many other senses, we disrupt Nature's balance within and without.

We spend more than 95% of our lives indoors, excessively separated from Nature. Home, school and work imprint us to our abstract artificial world, not to Nature's ways.

Our excessive indoor quantifying, qualifying and symbolizing imbues our thinking. It isolates us from Nature's global communion. It prevents us from thinking with our heart as do environmentally sound peoples.

9. Our removal from the natural world's sentient guidance produces our greed, runaway technologies and violence. Normally as children, mainstream rips us from our inborn balancing bonds with Nature. Our craving to reduce the angry, fearful hurt from this seperation overwhelms our rationality and we excessively bond to tranquilizing but often destructive security substances like chemicals, money, cigarettes, power, and euphoric technologies.

10. "One touch of Nature makes the whole world kin." to attain environmental and social balance, modern people must reconnect with Nature's ways.

yellow spotted
pond turtle

Oregon 4-H Conference and Education Center: Habitat Improvement Project

by Virginia Thompson, Manager

When the environment is modified to make life convenient for humans, the needs of wildlife are often overlooked. Yet habitat for wildlife can be provided in the backyards of homes, in parks and on school grounds. At the Oregon 4-H Conference and Education Center in Salem, this has been demonstrated with the help of 4-H leaders and youth who have assisted with work on the wildlife habitat improvement area in the heart of a busy camp site visited by more than 7000 persons annually.

The Wildlife Habitat Improvement project began in 1986, when the decision was made to convert a small stream with heavily trampled banks and an algae-filled pond into a haven for wildlife. With the assistance of Oregon State University Extension Wildlife Specialist Dave deCalest, a long-range plan for habitat improvement was developed.

Exemplary EE Programs

Information was sent to 4-H leaders across the state requesting assistance with the project. Many 4-H clubs and Extension Study groups were involved the first two years, contributing labor and funding to the wildlife habitat area.

Fences were built along one side of the pond and access to the stream banks was restricted. The stream banks were armored with crushed rock to reduce soil loss. Mini-rock dams laid across the stream create small cascades that help to aerate the water. In the pond mosquitofish (Gambusia) now feed on and control the aquatic mosquito larvae. Trees, shrubs and flowers have been planted that provide food as well as cover. Species planted include cherry, crabapple, plum, hawthorn, holly, gooseberry and rushes.

Shelter is provided around the pond and along the stream by song bird nest boxes, wood duck nest boxes and two brush piles. The song bird nest boxes and brush pile shelters were constructed by the South Salem 4-H Leadership club. Club members sought donations of lumber and the use of wood shop equipment for the box construction. Each year in February, the club visits the 4-H Center to clean the nest boxes. The old nests, eggs, dead young and wintering wasps and mice are removed. Clean wood chips are placed at the bottom of the box. Then it is ready for a new family.

South Salem 4-H Leadership members have continued to be involved beyond the initial development of the habitat area. 4-H'er Chad Mellott took on the habitat improvement site as part of his 4-H Conservation of Natural Resources project. Over the past two years, Chad has coordinated club workdays and donations, which include sixty five trees, 15 shrubs, hundreds of perennials and annuals and over 75,000 wildflower seeds. These included the pond edge plantings of water lily, cattail and iris.

Last spring Chad planted 125 willow cuttings along the stream bank. The cuttings rooted quickly, hastening the return of vegetation to the badly trampled, eroded stream bank. By summer the vegetation covered the water, helping to keep the water temperature lower, the oxygen content higher, and allowing more aquatic larvae to flourish.

As an extension of his 4-H Conservation of Natural Resources Project, Chad began to study the insects and native plants in the Habitat Improvement Area. Thanks to Chad's interest in these areas, the Center now has collections of insects and dried plant mounts available at the office to be used by outdoor schools and other natural resource education programs. Last year, Chad Mellott was honored for his conservation work by the United States Environmental Protection Agency when he received a President's Environmental Youth Award (see PNW Notes, Clearing #61).

The Wildlife Habitat Improvement Project has been a success at increasing the number and kinds of animals who use the site. A wealth of vegetation has replaced the bare soil of the stream banks and pond edge. Cool fresh water supports more insects, frogs and rough-skinned newt. The mosquito fish find shelter at the pond edge among the plantings of water lily, cattail and Dutch iris. The increased numbers of amphibians and fish rovide food for Kingfisher and Great Blue Heron. Chickadees, house wrens, brown creepers, hummingbirds and juncos raise healthy families on an abundant food supply. Bats swoop low over the water at twilight, drinking water and plucking insects from the air.

Development of the Wildlife Habitat Improvement area has made life no less convenient for human visitors to the Oregon 4-H Conference and Education Center. It continues to provide hands-on learning to youth involved in the development. The needs of man and wildlife have been met. Now an outdoor experience can be more fulfilling when visitors accept our interretive sign's invitation to "Sit quietly by the pond..."

Exemplary EE Programs

Bringing Back the Streams

Teachers Learn Some Valuable Lessons

by Patty Farthing,
Aquatic Education Specialist

"I repaired a riparian!" That's what several Oregon teachers are saying. Thanks to a grant from the Governor's Watershed Enhancement Board (GWEB), over 100 Oregon teachers had a unique opportunity to participate in an expense-paid watershed education workshop. Sponsored by the Oregon Department of Fish and Wildlife, the teachers spent a week with hands-on field activities and classroom materials that would help them conduct stream and watershed activities with their students.

Two five-day workshops were designed to create resource awareness and stewardship of watersheds. Each summer, one workshop was held at the OMSI Hancock Field Station near Fossil. A similar week involved teachers at the Oregon 4-H Center near Salem.

Selection of workshop participants required an application procedure designed to identify teachers who were committed to piloting and evaluating new curriculum materials in their classroom during the school year.

The teachers came from diverse locations including Riley, Vale, Cove, La Grande, and Pendleton, as well as Ashland, Glide, Rainier, Nehalem, and Coos Bay. Others attended from central Oregon, Portland, and Willamette Valley areas. At their schools, they teach subjects ranging from biology, chemistry, and physical science to forestry, vocational-agriculture and outdoor school. Their students range from grades six through 12.

The workshop format involved everyone in outdoor field work, collecting data and conducting investigations using The Stream Scene: Watersheds, Wildlife, and People. The session began with activities designed to identify and define a "watershed." Keeping the "watershed" in mind as the big picture; successive activities during the week allowed participants to experience riparian habitat, wildlife surveys and general investigations of the physical and biological components of a stream, including streamflow measurement, temperature, pH, dissolved oxygen, aquatic insects, fish, cover and habitat.

After three days of studying the system, the teachers on Pine Creek in central Oregon began restoration work on their creek. Their tasks included placing juniper rip-rap to protect eroded streambanks, planting willows to restore the riparian area, and instream work to create pools young fish can use for rearing and cover areas.

On Rickreall Creek in the Willamette Valley, the teachers placed, cabled and sealed large log sills to collect spawning gravel and create plunge pools. Brush and limbs were also cabled into the bedrock to provide important winter habitat for the fish.

The week-long workshops each concluded with the teachers using their new experiences to develop and share back-home action plans incorporating watershed studies into their curriculum.

The excitement, enthusiasm, and energy generated by these teachers is catching. Future students can only benefit from the commitment of their teachers. Oregon's kids are learning they can make a difference in the natural environment by participating in projects which bring watershed awareness to the public eye.

If you are interested in learning how you can become involved in this program, contact **Patty Farthing**, Aquatic Education Specialist, Dept. of Fish and Wildlife, Newport, OR 97365, or phone (503) 867-4741.

After Earth Day 1990... What?

by Milton McClaren
Simon Fraser University

There is every indication that Earth Day 1990 will be a great celebration, and a demonstration that millions of people are deeply concerned about the future of the planet. There will be a lot of media attention directed at the rallies in major cities of Europe and North America. And after the parades, speeches, and marches are over and the crowds have dispersed, there may be a sense that the demonstrations, in and of themselves, actually solved the problems of the planetary environment. Unfortunately, this will not be so.

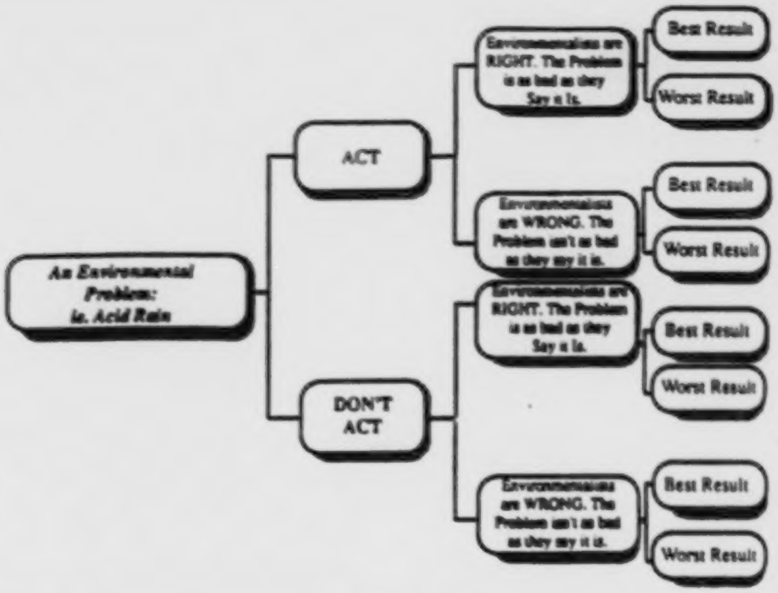
One doesn't have to adopt or endorse the tactics of some members of the Deep Ecology movement to agree with their basic claim that environmental problems are really symptoms of flaws, basic flaws in the ways humans think about their environment and themselves. Furthermore, since these flaws in thinking are perpetuated by both the curriculum and structure of Industrial Schooling, it is important for environmental educators to be aware of some of them.

The first flaw is the equation of growth with progress and goodness. The recent Globe 90 conference in Vancouver saw many examples of this error in the various presentations by representatives of government, business and industry. It appears that people assume that everything now being done in commerce is sustainable, meaning that policies related to so-called Sustainable Development need only be applied to new development, not to existing ones. Moreover, it is assumed that a healthy economy can only be defined as-one in which the gross economic product increases at 3-4% per year. As Paul Ehrlich, David Suzuki and others have pointed out many times, this is a formula for cancer. Our challenge is to begin to model economics on natural systems models. Natural systems don't grow indefinitely, but they do become diversified. They also cycle materials through the linked processes of composition and decomposition and evolve. The reinvention of economics is one of the gretest challenges facing the modern world. It will require a shift in thinking of the same magnitude as the Renaissance in Western Europe.

The second flaw in our thinking was characterized many years ago by Garrett Hardin as the assumption that the "technological fix is in," meaning that technology and science will find a way out of our conundrum through the application of new inventions or processes. No fundamental personal changes or sacrifices will be required. We will need our technological and scientific ingenuity to solve some of our environmental problems. We certainly need to know a great deal more about virtually all natural systems. But in the meantime, we also need to act now on what we do know. It is a corollary to this flaw to believe that information automatically compiles itself into action. Thus, the call for more research is often used, as in the cases of Acid Precipitation and Global Warming, to defer any significant action. In the final analysis the results of research only indicate or suggest possible actions. Human beings must still decide to act, choose from among options, and then have the persistence, patience, and courage to implement the approprtate, or best possible actions. In the meantime, as Hardin also pointed out, a decision NOT to act is a decision. Science, by its very nature, is always an incomplete work and understanding is always imperfect. But neither condition provides an excuse for not taking responsible actions.

If one wants to approach this problem in a cost/benefit analysis method one can compare the consequences of choosing not to believe the current findings of research (by claiming that they are incomplete) and to delay until there is more data, or until a technology is invented to solve the problem versus the consequences of choosing to act given current, by definition, imperfect knowledge, with the tools we have at our disposal now. Add to this two scenarios: in one, assume that the environmentalists are correct, in the assume they are wrong. In each case try to extend the process to the best and worst cases. A flow chart of this method would look something like the illustration.:

Another of the fundamental flaws in our current thinking, and one which is also woven through the fabric of modern economics, is the confusion concerning the differences among number, quantity, quality, and value. Numbers are the results of counting. Quantities are produced by comparison. Qualities and values are closely related because they reflect subjective attributes such as beauty, harmony, proportion, strength, and durability. In accounting, it is often the case that what counts is what can be counted. Thus, unless a umerical term can be


An Environmental Problem: ie. Acid Rain
ACT
DON'T ACT
Environmentalists are RIGHT. The Problem is as bad as they Say it Is.
Environmentalists are WRONG. The Problem isn't as bad as they say it is.
Environmentalists are RIGHT. The Problem is as bad as they Say it Is.
Environmentalists are WRONG. The Problem isn't as bad as they say it is.
Best Result
Worst Result
Best Result
Worst Result
Best Result
Worst Result
Best Result
Worst Result

assigned to something such as the beauty of a view, clean air, or biological diversity, then it remains intangible, and is often given no account in decision-making processes based on modern economics. What is the value of the contribution to the quality of the earth's atmosphere made in one year by the biological activities of the Amazonian Rain Forests? If, as it seems to be assumed to be, water is in infinite (or very large) supply, then surely water is cheap in supply and demand terms. In the consumer driven world of North America, Western Europe and the emerging Asian natons, people are ill equiped to address issues related to value and quality. These concepts have largely been excluded from the dialogues of modern instruction. In fact, number, quantity, value, and quality confusion lies at the base of the tyranny of testing which drives the curriculum and mystifies teachers and students alike. How do we score the student's love of reading, or her curiosity and imagination?

A final major flaw in our thinking concerns our view of our place in nature and of scientific understanding. Most human beings do not like to be called "animals." I once discovered this by ruining a pleasant New Year's Eve dinner in a restaurant when I casually suggested to a good friend and colleague whose education was mainly in the arts and humanities that he was kin to the other life forms on the planet, including the insects. He didn't appreciate being cast in with the bugs. Thus, we separate ourselves from nature and assume that the laws and processes that operate in nature do not apply to us, or that we can beat the game. Science has perpetuated this fallacy by being taught as "objective," as separating the observer from the observed. As Brunowski and others have pointed out, science is filled with subjective choices, but we often bury them deeply. Science gains its power by creating arbitrary and useful boundaries, by choosing what to study and what to ignore. It is good at thinking things apart. However, this same power often leads us to act as if the whole was in fact merely a collection of parts.

I sometimes take my students to the Nitobe Japanese Gardens at U.B.C. The garden is the work of a master landscape artist. After they have spent some time strolling the paths and enjoying the views, we gather and I ask them to imagine the separate elements of the garden: trees, rocks, moss, water, bridges, and so on. Then I ask them to visualize taking the garden apart with a back hoe and moving all of the components more or less at random or in a linear sequence of strips, to the parking lot of a supermarket. Surely we would still have the Nitobe Gardens. They are horrified at the idea. But modern science, and economics which uses pseudo or semi-scientific models and tries to gain the credibility of science through the mimicry, often acts as if this process of dissection captured the soul of the thing studied. We have much to learn from the holistic approaches to science and technology that are now beginning to be deployed. We must become as good at thinking things together as we have been at thinking them apart.

Earth Day '90 will be a great event — a celebration, a protest, and a demonstration. But when it is over we will have to get on with the really hard work of having an intellectual revolution, a revolution which begins in the mind of each person who begins to slowly remove some of the blinders to experience or filters of consciousness which I have described above. We can begin by treating people differently. We can begin by assessing the quality issues in our own lives. We can start to act differently, and by acting reinforce the changes in our consciousness. All great revolutions are fundamentally adventures into new frontiers of perception and understanding. We will need such an intellectual revolution if we are to do more than apply a few bandages to a mortally ill patient. But we have accomplished such revolutions before and we can do so again. Let's get on with it.

CLEARING

environmental education in the pacific northwest

Environmental Education... Mission Gone Astray

Steve Van Matre's new book, Earth Education: A New Beginning, is an intensely critical look at the current state of environmental education, calling it "fraudulent," and proposing a reevaluation of many of the practices we have called environmental education over the years. There are many who will disagree or feel threatened by his opinions. But we feel that it is important for anyone involved in environmental education to read and consider the ideas in this book.

By Steve Van Matre
(Excerpts from his new book *Earth Education: A New Beginning*, 1990, The Institute for Earth Education)

Environmental education may well have been the most important movement this century in terms of the health of our home, the troubled planet earth. Listen to what our political leaders were saying in the United States a couple of decades ago at the beginning of that effort:

> *The Congress of the United States find that the deterioration of the quality of the Nation's environment and of its ecological balance poses a serious threat to the strength and vitality of the people of the Nation and is in part due to poor understanding of the Nation's environment and of the need for ecological balance... (Public Law 91-516)*

It seems pretty clear in retrospect that what people were talking about in the sixties and early seventies was that the inhabitants of the earth did not understand how life functions here (the big picture ecological systems; they did not grasp how their own lives were directly connected to and supported by those systems; and they did not understand how they were going to have to change their lifestyles in order to live more in harmony with those systems – systems which governed all life on this small self-contained vessel they shared. In short, the earth was in trouble, and we were the problem.

So what happened to our original sense of mission and purpose? The call seemed loud and clear in the beginning, but somehwere along the way it faded into a favute, almost unrecognizable whisper. If you stop people on the street today and ask them what suports life here, they will probably be unable to comprehend what you are asking. It is likely that the most you will get is a response something to the effect that the people themselves support life, or even worse, that their city does. Isn't it tragic that most people can name a few of the trees we have planted along the streets but don't understand the flow of sunlight energy in our systems of life or the interconnectedness of all living things? We've focused on the pieces of life instead of its processes. We teach people the names of some of the parts of the earth, but fail to convey how it functions as a whole.

Most people simply do not understand how much trouble we are in here, nor why. For them, energy is oil, and the middle easterners and oil companies have teamed up to manufacture shortages in order to keep prices high. Cycles are Hondas or Yamahas, and diversity means tolerating your kooky neighbors. Thanks to the efforts of our mass media, people are aware of such problems as acid rain, ozone depletion, and toxic waste, but they usually don't see the connection between their own lives and the problems (and no one dares tell them). In one recent survey over 90% of the people interviewed thought that the scientists would take care of our environmental problems. Already over twenty million people on the earth die of starvation each year, yet many of our fellow citizens still believe we will establish space colonies to solve our burgeoning population problems.

People don't understand even the simplest of environmental connections: between fast-food burgers and the destruction of the world's forests, between decorative lighting or frivolous appliances and the accelerating costs of nuclear-generated electricity, between our over-packaged and over-processed foodstuffs and our growing difficulty in maintaining clean drinking water... or the very direct personal effect that such situations have on their own lives. That's enough; you probably get the point. In environmental education we never did the job we set out to do.

After two decades, millions of dollars, and far more words, many of the environmental education publications and projects, training sessions and manuals designed to change people's behavior have all but disappeared. What happened? I think we blew it, and it just may have been our last best shot.

... Poke your head into most any school today and see how much real environmental education you find going on there. I don't mean a couple of activities (inside or out) led by one or two valiant teachers, I mean *focused, sequential* instructional *programs* as a regular, integral part of the whole curriculum. Not much luck? Try the teachers' closets. That's where you'll probably find the most evidence. Look for the now unused books, boxes, pouches and kits that were once common to our field, plus the obligatory mimeographed curriculum guide. Chances are good that most of it gets very little use these days. And if a few teachers do include an environmenal lesson or unit, chances are good that they do not systematically address what environmental education set out in the beginning to accomplish, i.e., how life functions ecologically, what that means for people in their own lives, and what they are going to have to do to change their lifestyles in order to lessen their impact upon the earth.

Next, stop by your average nature center or outdoor school and see what you find there as well. The name of the place may have changed, but they're probably back to identifying the plants, doing tombstone rubbings, taking Ph tests, reading the weather gauges, making maple syrup, etc. In

WATER STRIDERS
WALKER

Seven Reasons Why Environmental Education Failed

- Defined its objective so broadly that almost anything could be somewhere within it;
- Promoted a supplemental, infusion approach instead of genuine, focused educational programs;
- Encouraged short term projects based on the issues, while largely ignoring the long-term lifestyle decisions of its learners;
- Accepted the funds and sponsorships available from the "cornucopian" agencies and industries that helped create the problems in the first place;
- Neglected to clearly distinguish itself from other groups interested in outdoor experiences;
- Provided no guidance for why some ecological concepts may be more important to convey than others;
- Generated mounds of conference paper, but no clear vision of a model to aspire to.

(from Earth Education: A New Beginning)

Environmental Education: Mission Gone Astray

(continued)

other worlds, they're probably offering a loose assemblage of outside activities (yes, with some sensory awareness experiences from Acclimatization and a few similar environmental games thrown in) all tied together by a schedule rather than a desire to achieve particular learning outcomes.

After you've made the rounds of our educational institutions, sit down and sift through some of the major so-called environmental education programs that were developed. You're in for a surprise. You'll find that several of them didn't even deal with basic ecological understanding, i.e., concepts like energy flow or cycling or diversity. You're asking, "how could someone possibly claim to have a comprehensive environmental education program and not deal directly and effectively with the fundamental base for all life on the planet — the flow of sunlight energy?" That's a good question. What's amazing is that its been so seldom asked.

Other projects, as you'll see, dealt with some of the concepts, but never attempted to clarify for their participants how their lives were connected to those concepts, nor suggested that they should examine their lifestyles in light of their new understandings. A couple of projects included a framework, even placed ecological understanding within it, but then provided only a disjointed, random accumulation of not very stimulating activities to get the job done that they had so carefully identified in their organizational structure. As a result, you often got either the activities with no good framework, or the framework with no good activities.

It's also going to be pretty obvious in your examination that for some of these projects their activities were created first and their objective formulated later. In fact, chances are good that any time you find an activity description that claims to accomplish several objectives simultaneously, then you've found an activity that was not developed with a specific learning outcome in mind. Instead, someone probably got a group together to come up with things to do, then figured out what their products were really going to achieve afterwards.

Perhaps the most damaging development though was the assertion you'll find in many of these projects that leaders should use the materials in any way they like. In other words, people should just pick and choose whatever caught their fancy, or whatever happened to fit with what they were doing at the time. Hardly anyone said, "Hey folks, if you're going to be serious about the task of environmental education, then it won't work just to sprinkle a couple of

Evaluating EE Materials

Try giving any material you analyze 100 points, then subtract up to five points for each of the following questions depending upon how well each one is addressed.

- **Who paid for the materials or funded the developers, and are their message hidden in the products?**
- **Are the leaders encouraged to build complete programs with specific learning outcomes or just to sprinkle around whatever catches their fancy?**
- **Can the leaders see the big picture they are working on and do they know how to go about fitting all of the pieces together?**
- **Does the introduction include a lot of lofty aspirations and high-sounding objectives, while the materials fall short in achieving those goals?**
- **Do the learning experiences really address underlying environmental concerns, or are they superficial, external treatments requiring little or no change in their participants?**
- **Are there specific models and schedules for the leaders to consider in how they will use the materials?**
- **Do the activities really accomplish what they claim, or does the leader have to talk them into doing their job?**
- **Are the activities tacked on just to get some doing in there somewhere, or are they integral parts of a learning model?**
- **Do the activities captivate and motivate the learners, or do they involve a lot of tiring and uninspired paperwork assignments?**
- **Do a lot of activities end up with "discussion" or "follow-up" lists that look good, but for which there is no built-in motivation or mechanism to insure that they are actually carried out?**
- **Do the activities deal with basic ecological processes and their meaning in people's lives, or do many of them focus on secondary concepts and concerns?**
- **When they are participating in the activities, do the learners know where they are going and why?**
- **After they are finished with the activities, do the learnings know what they can do next, and are they encouraged and supported in doing it?**
- **Are the essential activities mostly classroom-based exercises that require little or no contact with natural places and processes?**
- **Do the activities fire the learners up about our environmental problems but fail to address how they are part of them?**

(from Earth Education: A New Beginning)

ronmental education, then it won't work just to sprinkle a couple of activities around like so much spice. You're going to have to put together some focused, sequential programs to get the job done. Just bagging up a batch of activities and calling them a program is like tape recording a batch of sounds and calling them a symphony..."

In the end, I think we're going to have to face up to it: a lot of otherwise well-meaning people have been misled about the nature and purpose of environmental education. And as a result its become everything to everyone, and not much of anything to anyone. One of my favorite definitions that appeared in the early days was the one that goes "environmental education is education that is in, about, or for the environment." Gosh, no wonder people got confused. Under that definition, what *isn't* environmental education? And if any of these perplexed folks went off to a national conference looking for some answers, they would probably find everything from orienteering to acid rain on the program. Or in other words, everything from outdoor recreation to environmental studies. It's not wonder that the idea of developing focused, comprehensive education programs seemed to get lost in all of this jumbled potpourri of goals and offerings.

Here's the bottom line: we don't need collections of supplemental curriculum activities. They won't get the job done. We need specific, comprehensive units of instruction for specific settings and situations. Let's develope these focused programs and then go out there and sell them to the boards of education, youth groups, nature centers, adult organizations, park districts, etc. Anything short of this will only further the educational hypocrisy that already exists.

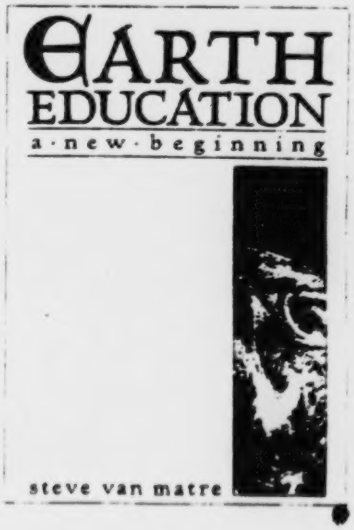
(for more excepts from this book, see CLEARING issue 55)

Excerpts reprinted from *Earth Education: A New Beginning*, © 1990 The Institute for Earth Education, Warrenville, IL. Permission to reprint must be granted by I.E.E.

If any "environmental educators" would like to respond to the comments and criticisms made in this article, please feel free to write your thoughts in an article and send them to us. CLEARING will be happy to print the rebuttal in an upcoming issue.

Earth Education: A New Beginning

By Steve Van Matre
Published by The Institute for Earth Education
$20.70 (ppd)



For the past few years, Steve Van Matre — creator of the Acclimatization, Sunship Earth and Earthkeepers programs — has been chastizing the environmental education movement for its deficiencies. He has said that environmental education has been "led astray" by well-meaning educators trying to be all things to all people. EE, he goes on, has been

-trivialized by mainstream education,
-diluted by those with other agendas, and
-co-opted by the very agencies and industries that have contributed so much to environmental problems.

This book has been in the making for several years, and contains the definitive Van Matre philosophy on what works and what doesn't in environmental education.

Filled with quotes, anecdotes, examples, and narrative, Van Matre discusses in depth the problems of environmental education and the alternative of his Earth Education approach. A whole generation of teachers and leaders, he says, have lost their way, misled by traditional environmental education. They need to be brought back to their original purpose: to teach for the earth.

He says environmental education needs to get back to what it set out to do in the first place: to help people improve upon their cognitive and affective relationship with the earth's natural communitiels and life support systems, and begin crafting lifestyles that will lessen their impact upon those places and processes on behalf of all the planet's passengers.

He says that supplemental curriculum materials do not work, and sites Project WILD and Project Learning Tree as examples of programs that have monopolized the agendas of many environmental educators, yet they provide only a fragmented, narrow focused approach to learning.

Whether or not you agree with Van Matre's premise and arguments, this book is an important statement on the state of the art. We can all use it to gauge the effectiveness of our own EE programs, and to get us thinking about what we are trying to do.

The book can be ordered from The Institute for Earth Education, IEE's Publication Service, P.O. Box 200, Trout Lake, WA 98650. The price is $20.70.

perspectives on environmental education

Environmental Education and Environmental Advocacy: The Need for a Proper Distinction

by Bob Jickling
Simon Fraser University
Burnaby, British Columbia

In 1969 Bill Stapp wrote about environmental problems and proposed a new approach designed to reach citizens who were increasingly being asked to make decisions which would affect environmental quality. He called this new approach environmental education. Environmental education quickly became a rallying symbol, or slogan, capturing the ideas and attitudes of a growing educational movement and drawing attention to the need for a citizenry which could think clearly and critically about environmental issues. While slogans are often useful they can, in time, be taken as literal doctrines or arguments (Scheffler, 1960). It is now important to evaluate environmental education, and goal statements attributed to it, as straightforward assertions.

Taken at face value, the term environmental education must first be concerned with education and second with content about the environment. Environmental educators must acknowledge that this field of study is legitimated by the degree to which it supports the broader concept of education. I will argue that our failure to pursue environmental education within a clearly articulated framework for education has weakened its conceptual basis, and that it may frustrate efforts to make environmental education more persuasive. I berlieve that these problems are exacerbated by a failure to be clear about the different roles that we may choose to play in society. While it may be important for citizens to actively promote changes in attitudes and behaviors, this must not be confused with our work as educators. We must, I will argue, be sure that we are educating rather than advocating a particular environmental view.

Education is concerned with the acquisition of worthwhile knowledge and understanding. In stressing understanding I wish to make it clear that an accumulation of disjointed facts is not enough. The educated person must also be able to perceive relationships between these bits of information and the conceptual schemes which allow us to organize the facts — they must have some understnading of the "reason why" of things. The educated person will not just perform certain operations in a certain way but will have some understanding of the principles which govern such actions. It is important to recognize that a crucial distinction exists between "education" and "training." Training is concerned with the acquisition of skills and abilities and frequently has instrumental connotations. For example, we speak of training as a plumber, training as a secretary, or training as an engineer. In contrast, we speak of a person being more or less well educated, indicating a broader and less determinate understanding which transcends immediate instrumental values. Surely, what we most want as educators, is to enable students to think clearly and critically about the world that they live in, including their environment and the issues which surround human relationships with that environment.

The question now is: Do the espoused goals for environmental education enable students to think clearly and critically about their environment? A common expression of environmental education's ultimate goal is that it should seek to produce "Environmental affirmative citizenship." It is not difficult to imagine a well-educated person who is committed to a particular environmental viewpoint or involved in mediating environmental conflicts. However, it is inconceivable that the production of such citizens should be a necessary or sufficient outcome of environmental education. As we have seen, we do not apply the term "education" to the achievement of some particular end. We normally use the term "training" for the development of such specific behaviors. Thus we may train a person as an activist, advocate, or as an environmentally-affirmative citizen. If we push this point further we will recognize that the term "environmentally-affirmative" has evaluative connotations. We are implored to provide an education which results in environmentally affirmative rather than environmentally-negative students. The thrust of this "ultimate goal" for environmental education is now clearly seen to encourage the modification of individual behavior in a prescribed direction. Education, however, transcends such immediate instrumental values such as the advocacy of a particular sort of behavior.

A second frequently held goal for environmental education is that we should aid citizens in becoming environmentally knowledgeable, skilled, dedicated, and willing to work toward the achieving and/or maintaining a dynamic equilibrium between quality of life and quality of environment. Again we must raise questions about the nature of such a goal. First the concept of "skill" is closely tied with notions of training and perfection through practice, and minimally involved with understanding, and the goal of modifying behavior is purely instrumental in nature. Second, the object of these intentions is unclear: what is a dynamic equilibrium between quality of life and quality of environment? I, for one, am not sure that I would recognize such a "dynamic equilibrium." What we appear to have here is an attempt to reduce complex moral reasoning to a concept derived from the sciences. Such reductions will utimately do little to assist our students in making judgements about what *ought* to be done.

Also suspect are goal statements which speak of "training in environmental problem-solving skills to enable citizen participation in environmental issue remediation." While I doubt very much that it is possible to reduce the ability to solve problems to a set of skills in the first place, we are again talking about training and not education. Beyond this, however, we should consider the likelihood of students actually solving infinitely complex environmental problems. Perhaps we do not assign sufficient concern to our vast areas of ignorance concerning the complexities inherent in phenomena commonly regarded as environmental problems. Furthermore, to urge action which is unattainable and futile is a disservice to persons, and to serious thought about these problems. Surely it is not "overt environmental behavior" that we wish to foster in the name of education. I would like to think that, in many instances, a thoughtful rational student would decline to act if the arguments presented were not clear, or if insufficient information was available to make an informed decision.

Our task is not to produce "environmentally-affirmative citizenship," or "environmentally active individuals," or simply to "develop problem-solving skills," or to encourage "independent overt environmental behavior," or to achieve "overt citizenship action." Our task is clearly to educate. This is inextricably linked to acquisition of knowledge and understanding, commitment to understanding the "reason why" of things, and care about the use of reason. Specific overt action cannot necessarily be expected of the educated person. He or she may not feel adequately informed, may perceive unresolvable conflicts, or identify greater priorities elsewhere. Even less can be overt action to follow a prescribed course, or to take a predetermined direction. It would be presumptuous to expect the educated person to display environmentally-affirmative citizenship. Educational achievement should enable individuals to act intelligently, but people will not act intelligently if they have been trained, brainwashed, conditioned, indoctrinated, cajoled, coerced, or bribed to behave in a certain way.

What, then, should be the future direction of environmental education? Rather than attempting to achieve a behavioral response, we should give more weight to questions about what constitutes knowledge and understanding, and what environmental content would be most worthwhile. I believe that we must redirect more of our attention to epistemological responsibilities. What different ways of thinking, or forms of knowledge and understnading, are required by our students to think clearly about environmental problems? At the very least we must ensure that they can distinguish between empirical and philosophical questions, a point lost in much environmental education

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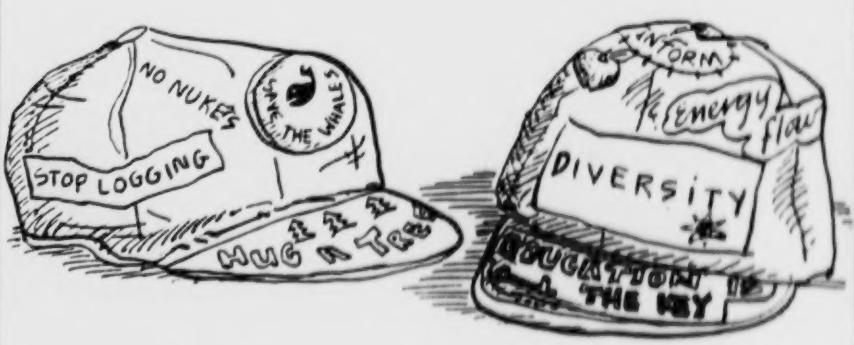

How do you separate the environmentalist from the environmental educator?

Two Hats

by John Hug

It would appear that environmental educators have a bad case of the "two hat" problem. We have come by the problem naturally and therefore, we have paid little attention to it.

The problem is simply that industry, utilities, labor, business, media and other segments of the population and the gneral public have consistently recognized only one hat when talking about environmentalists and environmental educators. It is not uncommon for dedicated environmental educators to be summarily dismissed as troublemakers — environmentalists. This one hat view is easily explained because environmental educators are almost always environmentalists. Perhaps definitions will help clarify the problem.

Any world citizen who advocates with greater or lesser action that wrongs against our environment must be stopped is an environmentalist.

(continued on next page)

Environmental Education and Environmental Advocacy: The Need for a Proper Distinction

(continued)

literature. As Australian philosopher, John Passmore (1974) points out in his brainteaser: "Ecological problems are not problems of ecology." By this he means that environmental problems are, by their very nature, different from problems of science. While science will inform our thinking about an issue, this mode of inquiry can only tell us what is, or project what might be, the case. It is moral reasoning that will enable us to decide what we ought to do. There must, therefore, be distinct opportunities in environmental education for students to learn to think scientifically and phiolosophically.

Thinking clearly about environmental issues also requires the ability to bring into play a breadth of modes of inquiry and understanding. Students' ability to think clearly about a situation will be contingent upon their ability to think scientifically; think philosophically; think morally; think historically; think aesthetically, and not upon their mastery of some superficial skills. More attention must be given to thinking about how this can be effectively achieved. This does not preclude engaging students in thinking about particular environmental issues; in fact, this will likely be important. In the name of education, however, this must not be done as a means to modify behavior or with the naive promise of solving problems.

We must recognize, as educators, that thinking is not a simple skill, but is inextricably linked to content. As we frequently observe, those who are best at thinking clearly about an issue are the people who have the most information. Content must, therefore, be selected both of its ability to develop in students the ability to think scientifically, morally, historically, aesthetically, and so on, as well as its utility in enabling students to thoughtfully consider issues of great importance to them. I believe that more attention needs to be given to arguing for the inclusion of environmental content into all fields of inquiry.

What this means to us, as concerned citizens and as educators, is that we must make clear and proper distinctions between our various roles in society. As citizens we must continue to advocate changes in social behavior towards the environment. Our quality of life, indeed our very survival, depends on it. As educators we must be sure that we are in fact educating. If our arguments made as citizens are sound, our students may accept them. If they are unacceptable, our students will have the ability to evaluate them as such, and the freedom to reject them. Environmental education will stand a greater chance of becoming more pervasive when it begins to stand on a more conceptually solid footing. This will require a clear distinction between "education" and "training" and between "environmental education" and "environmental advocacy."

Two Hats *(continued)*

Perhaps the negative reputation environmentalists have stems from the dramatic and radical actions of a few.

An environmental educator, on the other hand, is any world citizen who uses information and educational processes to help people analyze the merits of the many and varied points of view usually present on a given environmental issue. The environmental educator is not the "mediator," "trade-off specialist" or "negotiator," but a developer of skills and an information analyst who prepares the people (from any segment of the population) who will participate in environmental decision making.

Environmental educators, therefore, need to be as "value fair" or "value free" as they can when working in this role. they must scrupulously strive to get all the facts, examine and illuminate all the viewpoints, and keep from letting their own particular position (as an environmentalist) from mixing with their educator role.

My suggestion is simply that environmental educators make an effort to clarify the two distinct roles. At every opportunity, we should emphasize the neutral nature of environmental education activity. Strong advocacies are all around us, each using the techniques of persuasion and propaganda to build their constituencies. We must ourselves be familar with all sides, stand firm for each advocate's right to be heard and provide a rational stage for informed debate.

Environmental educators have the right and the duty to be environmentalists, but the dual roles must adhere to the original premise - to keep each hat on its proper head, while utilizing to the fullest the professional skills of the environmental educators.

John Hug

-reprinted from A Report on the North American Regional Seminar on Environmental Education: A Confrontation with the Issues: Environmental Education for the Real World. Columbus, OH: SMEAC Information Center, 1977.

BEST COPY AVAILABLE

Environmental Education
in the Pacific Northwest

Exemplary EE Programs

Teachers and Kids Can Be All Wet

See How You Can Learn the Secrets of the Swamp

Lin Howell
Biology Instructor
Glencoe High School
Hillsboro, Oregon

Today the naturalist, professional and amateur alike recognize the wetlands as an unrivaled site for partaking of nature's choicest offerings. There it is indeed likely you will experience a sense of reverence associated with the sights and sounds of nature. From the rhythmic drumming of a pileated woodpecker to the gentle flutter of a giant swallowtail, our senses are filled.

The very nature of a water-laden environment guarantees an abundance and enormous diversity of life forms will be found. Our freshwater wetlands provide a footing for thousands of resident species, both plant and animal; provide water for upland species; provide cover and moisture for nest site and subsequent young; and provide vital rest areas for migratory species. The variety of organisms found exclusively in such a habitat is abundant.

Wading through swamp water, watching birds, and painting spots on grasshoppers may seem unrelated, but they are all a part of the Advanced Biology class at Glencoe High School. Starting a program such as this requires a facility. In Glencoe High School that facility is right outside the science room window - a perfect ecological setting for study. Five acres of wet and forested land - an ecosystem arena to delight any naturalist and certainly an ecological biologist.

This project started five years ago when a group of people representing several agencies, Hillsboro Park and Recreation, Forestry Dept., Soil and Water Conservation, Wildlife Biologist, and several interested faculty people gathered to consider enhancing the natural area for the purpose of environmental studies. For the next two years, meetings were held in conjunction with visits to the area. We were attempting to determine if any major enhancements, such as digging the pond deeper, were necessary. The outcome of the meetings - the area was self sufficient and would not presently need any major enhancements other than the pathway for ingress and egress.

Using people serving their community service with Washington County Corrections, a section of recalcitrant blackberries and other vines was cleared, and a path over a quarter of a mile long was constructed. It took three truck loads of gravel to form the path bed. This was covered with hog fuel donated by a local nursery. The work is not finished; however, it is ready for use. In the future we hope for a floating dock from the shore to connect with the area opposite the path. A circular path will then be constructed. A nature trail through wetlands and forested areas for handicapped is the ultimate goal of the school.

In the meantime, nearly 400 science students are using the area to varying degrees. The most dominant group, the Advanced Biology class. The curriculum used is a combination of "The Stream Scene," the curriculum developd by Oregon Department of Fish and Wildlife and edited by Patty Farthing, and several teacher-written labs approriate to the area.

The classes conduct outdoor nature studies on their watershed. All points of study are conducted by groups of 3 students per 100 feet of stream. Their goal is to determine the organisms living in a section, the "niche" or role the organisms play, and what makes that particular spot most advantageous for that organism.

The primary goal of science education is to help students develop meaningful conceptual understandings of science and its ways of describing, predicting, explaining and controlling natural phenomena. A central goal of science teaching is to help students change their intuitive, everyday ways of explaining the world around them to incorporate scientific concepts and ways of thinking into their personal framework. Students need to do difficult, cognitive work that includes the use of science processes (predicting, hypothesizing, observing and inferring). They do not, however, practice these processes in isolation and the goal is not for them to be better observers or predictors. Instead, these processes are used in the service of developing better explanations of natural phenomena.

The students of the course complete seven one-week labs on their 100 feet of stream: 1) mapping; 2) pond community (the study of invertebrates); 3) soil organisms (use of the riparian zone); 4) populations (small mammal and plant); 5) water quality (temperature, pH, dissolved oxygen, nitrates, and flow rate); 6) microsuccession in a rotten log, (death is a part of the life cycle and it is important to study this completion); and 7) bird and phot survey (birds are an important part of the riparian ecosystem).

At the conclusion of these labs, students are asked to present their data orally, and to show others how their area looks through the eye of a camera in 20 to 30 minutes.

My past experiences with students have made me acutely aware of a need for environmental education. We are on the crest of a wave. Will we, as environmental educators, be able to take the next step from pioneers in the field to managers developing comprehensive programs that meet the needs of individuals and communities. Realizing we have made a beginning and knowing it is vital that students obtain an in-depth understanding of the environment and the problems that confront the world they inherit.

The class gives students the opportunity to do independent research, letting them discover for themselves the various ways in which this environment functions.

Many of the students enjoy the freedom the class offers.

"It's the raddest class," senior Michele Herb said. "We don't just sit in the classroom reading about things, we get to experience them."

Senior Owen Brennan likes the class for its liberty too, but also because it calls for self-motivation.

It is my opinion that with growing recognition among Oregonians of the importance of watersheds, involving students in the study of water and its environmental relationships is a timely investment. Only through understanding watersheds and riparian areas can we understand how to maintain the health and integrity of these systems.

The final goal of this course is to develop awareness, knowledge, skill and commitment resulting in informed decisions, responsible behavior and constructive actions with regard to watershed management.

Island County/ WSU Beach Watchers Program

Island County, Washington is located on the Northwest border of Puget Sound, and is comprised of Whidbey and Camano Islands. If you have ever visited the areas, you will understand the depth of concern and commitment most island residents have in protecting and preserving this beautiful corner of the planet! We are surrounded by beaches of every variety, ocean and inland waters, wetlands, forests and rolling farmland, and panoramic views of the Olympic and Cascade Mountains. Being totally surrounded by water, we not only appreciate the beauty of this natural resources, but also realize the vital importance of water for our very existence.

We have experienced much changed and growth in Island County as people have discovered what a special place this is to live. Coupled with the current problems of pollution faced all over the world today, Island County residents are becoming fearful for the future of the Islands' delicate ecosystems and wat to do whatever they can to preserve the beauty and natural resources of our land and water.

In the Spring of 1989, Island County/WSU Cooperative Extension Agent Donald Meehan decided this was a top priority issue on his agenda, and began the long and arduous process of finding money to finance a water-quality education program for the people of Whidbey and Camano islands. In February of 1990, Don and the "Island County/WSU Beach Watchers" received a 1 year grant from the Department of Ecology's Centennial Clean Water Fund.

The Beach Watchers Program expands upon the concept developed by Clallam County's "Bay Watchers" program; and is similar in design to the Cooperative Extension's Master Gardening Program, where free training and resource materials are exchanged for community volunteer time. The Program consists of a 7-week course, meeting 2 days per week, 6 hours per day; combining classroom lectures with field trips and hands-on learning experiences. Although the focus of the class is water quality, upland activities which affect water quality are addressed as well. Course topics include Stewardship, Geology, Wildlife and Birds, Aquatcultures, Oil Spills, Marine Debris, Watersheds, Wetlands, Marine Biology, Soils, Erosion, Groundwater, Pesticides/Fertilizers, Farming, Forestry, Shoreline Regulations, Septic Systems, Household Hazardous Waste, Recycling, Landscaping, Volunteerism, and Communication and Teaching Methods. Instructors for the course are professionals in the field of each particular topic, many being County personnel, Washington State University professors, or specialists from the Department of Ecology and the Puget Sound Water Quality Authority. The Spring Beach Watchers course began March 12th, and will culminate April 27th, with an additional Summer Course being offered in July and August.

After graduation from the Beach Watchers course, the student/volunteers will each offer 50 hours of community volunteer service within the following year, including adopting a beach through the Adopt-a-Beach Program. Some of the projects we are currently involved in are Earth Day Activities, Marine Debris Surveys, Slide Shows, and speaking engagements for schools and community organizations. An on-going Beach Watchers Association will be formed, to help coordinate and plan volunteer projects; and to continue education by way of inviting guest speakers to each meeting.

The main goal of Island County/WSY Beach Watchers is to educate our Island communities about the fragility of our ecosystems and water resources; and to develop a stewardship ethic among the people who live, work, and play here. To achieve this, we are educating citizens to become trained volunteers who can share their knowledge with their neighbors and communities, and who can take action through volunteer projects to protect and preserve our islands and the waters of Puget Sound.

We are proud to offer such an exciting program, and are very pleased with the number of first rate volunteers who have applied for the Beach Watchers Program (we currently have a waiting list for our summer program which exceeds the number of students we can accept). The time is right for the programs such as Beach Waters, and it it our hope that we can obtain sufficient funding to offer this one year pilot project as a permanent and ongoing program for Island County. It is also our hope that other Counties and States will look to us as a model in providing similar programs for their communities. For more information on Island County/WSU Beach Watchers, please contact Donald Meehan, Program Administrator, or Susan Berta, Program Coordinator, at the Island County/WSU Cooperative Extension, P.O. Box 5000, Coupeville, WA 98239, or phone (206) 679-7327.

CLEARING
environmental education in the pacific northwest

Wholearth Learning: Sustaining and Enhancing a Liveable Future

Reprinted from the proceedings of the 1985 Conference of the North American Association for Environmental Education in Washington, D.C.

by Cheryl Charles

I would like to ask you to reflect a moment on what you want young people to know and to experience in order to best prepare themselves for a sustainable future of peace and quality on a healthy planet. Think about what you want young people to know and to experience — for their own health, and for the long-term health of this planet.

I want young people to know our home is a living earth — a home that we share with people of widely diverse cultural experiences and physical settings — as much home to the humans, plants, domestic and wild animals of South Africa as it is to those in China and India and the Netherlands and the Yukon and Honduras — a home that transcends the blue lines of maps and the flags of nations.

I want young people to experience how the living world works — to get outside, breathe the magic of living skies, and share, as Margaret Mead and Rachel Carson and others before us have said, "a sense of wonder."

I want young people to know they can make a difference — that each day we make choices and take actions from small to large that can improve our lives and the lives of others — and, conversely, can have negative consequences — so we need to pay attention to our actions.

I want young people to experience personal dignity, fairness, and justice — extending this experience to themselves, to other humans, and to other elements of this living earth we call home.

I want young people to recognize that learning is life-long.

I want young people and learners

Wholearth Learning

by Cheryl Charles

(continued)

commitment, compassion, and ultimately responsibility... from person to planet and back again to person, to each of us individually as a part of a personal cycle of life and learning that helps to conserve and protect the qualities of ongoing life and health and beauty for generations to come. Concern for generations to come is not to be species-centric. Rather, we have a responsibility to all other life forms as well — not that we can always make a difference, but that we do have to maintain a clear sense of our responsibilities for the consequences of our actions.

> **"We need to continue to proceed actively and enthusiastically with what we call an infused or integrated approach to education about the environment."**

With that as a small sampling of my concerns and my biases — and you with a sense of those you hold most dear — let me turn to some practical applications: What are we doing as educators within and about the environment — and what else can we do?

I would like to suggest that we need to continue to proceed actively and enthusiastically with what we call an infused or integrated approach to education about the environment. An infused approach is one whereby concepts, skills, attitudes, and experiences related to the environment are integrated within the mainstream school curricula — showing up in every major school subject and skill area, like social studies, science, language arts, mathematics, physical education, and the arts. An infused approach, by my definition, does not preclude our present specialized courses of study or units directly related to environmental topics showing up in the curricula. We can have courses in environmental problems, wildlife, forestry; minicourses on pollution, acid rain, endangered species; and units on a range of environmental topics. However, an infused approach is based on a belief that concepts related to the environment provide an overriding, overall framework and are an appropriate part of every major area of the curricula — in fact, are a necessary approach to every major area of the curricula in order to nurture informed and responsible citizens for a healthy and peaceful planet earth, now and in the future.

I am certainly aware of some of the risks. Chuck Hopkins of Toronto has cited a confusion that can arise with such an approach, suggesting that "What's looked after by everyone is looked after by no one." I share that concern, but believe the risks to be surmountable.. I therefore believe philosophically in an infused aproach. I also believe it is a realistic approach, given the characteristics of contemporary schooling. As one form, one tool, for an infused approach, I completely and enthusiastically support what has been called an activities-oriented approach to environmental education. I do not think environmental education is a mission gone astray.

> **"I do not think environmental education is a mission gone astray."**

Let me [make] five specific recommendations for some of our continuing work with teachers of kindergarten through high school age young people:

1. I recommend that we keep supporting an infused and integrated approach to environmental education. That simply means, in my judgement, that we keep providing teachers with means to teach concepts, skills, attitudes, and behaviors related to being and becoming responsible environmental citizens as a part of teachers'day-to-day teaching. We keep providing materials and strategies for teachers's use as a part of their social studies, science, language arts, mathematics, arts, and other instructional areas. This does not mean that's all we do. We need multiple strategies. We need to opt for diversity. But the overriding framework — the thread of continuity — is an infused approach.

2. I recommend that we keep providing tailor-made tools for such infusion. that means that we need to keep taking the time and trouble to correlate our environmental education resources with such things as state and local-level minimum competencies and guidelines, as well as textbooks. Such correlations make it immediately evident to school administrators and others that when teachers are using these environmental education materials, they are also simultaneously teaching for the local and state requirements in the academic areas.

3. I recommend that we keep providing workshops for teachers as well as other professional development opportunities. Ideally these are voluntarily attended, not required. Pre-service and in-service programs for teachers are essential for a variety of reasons. Three examples: they provide additional background for teachers; they provide time and tools for actually integrating this earth-based perspective within the curricula; and they are or can be a great morale boost. Ah, there are other people out there who care about some of these thing, and besides that, it's good education!

4. I recommend that we let people know that good environmental education is good education. It's based on sound principles of teaching and learning. It nourishes and supports whole learners. What are some of the obvious characteristics of such whole-earth instruction? It makes use of diverse instructional strategies. We use hands-on experiences, outdoors and indoors. We see some delivery of information in a concise "lecture" format, but an inconsequential percentage contrasted with typical secondary and college instruction today. It's okay for classroom teachers and students to make some use of a textbook approach — but nothing like

Wholearth Learning

by Cheryl Charles

the 90-percent dependency which is characteristic of most classroom-based education today. We see small groups and large groups, discussion and debate. We see varied visual approaches, not just verbal. We see whole body activity, not just mouths moving when asked to respond to questions. Environmental education is characterized by diverse instructional strategies — so none of this is surprising. What we need to do a better job about, however, is reminding people that these strategies are characteristics of good science instruction, good social studies instruction, good language arts instruction, and good education overall. The dominant advantage of environmental eduction is that its ultimate source is just a door away — a door that leads to the first classroom, outside. Thus, environmental education becomes a way to improve teaching and learning throughout school instructional programs. We have more to offer than concepts and skills. We have powerful tools for effective instruction as well.

9. I recommend that we do everything in our power to move from "piece meal to pervasive." I do want to see whole schools and whole school districts actually taking a systematic and thoughtful approach to integrating earth-based education throughout their curricula. I want children to experience such an education at every grade level — not just occasionally from a gifted primary teacher, or an enthusiastic fourth grade teacher, or from a rare high school teacher. But even piece-meal makes a difference. Any time, at any age, people can acquire new insights, real knowledge, new skills, and experiences which will in fact translate into changes in their own lives and constructive actions for the planet.

Most of my comments have focused on mainstream educational systems. As an aside, I want it to be clear that I commend and encourage all of those of you who are working in the area of non-formal education — through nature centers, naturalist programs, scouting and other youth programs, in preschools, and through activities for long-living people, as well as in ways I still have not mentioned. I believe that our approaches must be diverse and they must be simultaneous. We've lots to do to support a developing citizenry who can really sustain and enhance a liveable future for life on this planet, now and in the future.

Earth-based education must begin with the earth itself. Jay Hair mentioned that by the year 2000, ninety percent of the people in the U.S. will be living in cities. More than ever, we will have a compelling need to invite people into experiences with the living earth. Education must begin with how the earth works — and then how we as people interact with and affect, both positively and negatively, our earth home... from the immediate confines of our home and family to the entirety of our earth home.

Education within and about the environment must begin with the components of life itself. Soils, plants, air, water, animals... all the elements of a living earth must be examined and cherished. Such building blocks of understanding are essential before we can tackle what are identified as issues and problems. As soon as something is called an issue, it has been taken out of context. Somehow, people are polarized around it. We as educators within and about the environment have a responsibility to help people put issues back in context — to ground issues again in the living world — so that more informed and responsible decisions and actions can then be made.

"We as educators within and about the environment have a responsibility to help people put issues back in context — to ground issues again in the living world — so that more informed and responsible decisions and actions can then be made."

To speak of issues reminds me that there is the potential in the area of education within and about the environment for topics to arise which may be controversial. As environmental educators — as educators — I believe we ought not to avoid or reject topics of potential controversy. We do, however, have a genuine responsibility to make every effort to create and maintain a climate of fairness and balance in the process of education. That, in my judgement, is what true education is all about. Sometimes, in that process, topics of controversy may arise. If and when that happens, we need to provide young people and their teachers with access to a representative and balanced range of views and perspectives. We need to do so carefully — with integrity, honesty, and accuracy — advocating no one point of view, but supporting a process of learning about views in order to come to one's own informed judgement. I have learned through a series of events and circumstances during this past year that when topics of controversy arise, everyone seems to think he or she is in the middle. One

person's balance seems to be another person's bias. It is not easy. The bottom line, however, for us I think, is that we in environmental education cannot shirk our responsibilities. We must acknowledge that some topics of genuine concern and importance will sometimes be greeted as controversial, that equally earnest and thoughtful people may sincerely differ and disagre as to what is ethical and appropriate. What we as educators must do then is our very best to ensure that the process of education is grounded in quality, balance, and fairness. I believe it is our responsibility — as stewards of the process of education, as well as guardians of our actions to sustain a living earth.

We've a long way to go, and yet I sincerely believe that significant progress toward a sustainable future of quality and health has been and is being made. Brown pelicans and peregrine falcons return to the skies, Puget Sound and the San Francisco Bay have improved in overall quality and health in the last 15 years, certification and curricular requirements in environmental education appreared in Minnesota and Wisconsin recently, as well as other states, and the public opinion polls consistently show a deeply-rooted concern for the environment and its quality as an integral part of the North American psyche, and a world psyche.

So keep up the good work that each of you is going in your own personal way. Every effort matters. Some is public, most is not. Remain confident and concerned — committed and yet creative — flexible as well as focused — persistent and still passionate. Maintain your own individuality and integrity, even as you are part of this larger earth family and home.

Cheryl Charles is the National Director of Project WILD and a co-director of the Windstar Foundation.

Recomendations for Action in Environmental Education

PROVIDE THERMATIC INSTRUCTION THROUGHOUT THE CURRICULUM

Environmental education is taught thematically in every classroom at all grade levels: all students participate in environmental studies and projects. Students participate in experiential learning activities that are true to ecological principles and the themes of the core curriculum, particularly science and history/social science. Literature-based programs include books with environmental topics and which support the themes and concepts of the science curriculum.

CONDUCT ECOLOGY LESSONS IN BUILT AND NATURAL SETTINGS

Environmental education is conducted in all school settings: indoors and outdoors, and at suburban, urban, and rural schools. Every child has a residential outdoor science school experience in fifth or sixth grade. Experiential learning through field studies at each grade level contributes to the understanding of diverse ecosystem and values structures.

VALUE LIFELONG LEARNING ABOUT THE ENVIRONMENT

Students and staff members value the lifelong process of educating themselves about local and global ecological issues as they relate to society and self. Career exploration in the environmental sciences is provided to all students.

PARTICIPATE IN ECOLOGICALLY RESPONSIBLE ACTION PROJECTS

Principals and teachers serve as team members and role models for the students; provide the opportunities for students to be responsible for ecologically sound classrooms and schools; and participate with the students in community action projects.

EMPHASIZE THE HIGHER ORDER LEARNING PROCESSES AND EDUCATE THE WHOLE CHILD

Students apply basic learning and communication skills and higher order thinking processes in the context of current community issues. Environmental studies and action projects involve the whole child in cognitive and affective learning experiences, nurturing each student's intellectual, social, physical and emotional well-being.

PROVIDE DEVELOPMENT OPPORTUNITIES FOR ALL STAFF MEMBERS

To effect an ecologically sound school, all staff members must understand the ecological reasoning behind each responsibility. Teachers must be familiar with environmental education curriculum materials to choose wisely those that best suit the unique characteristics of their student population and their bioregion. Custodians must understand the crucial nature of their impacts as role models for reusing and recycling materials used at the school and developing innovative programs to suit the needs of the school. Classified staff members contribute their initiative, enthusiasm, and interest to classroom and schoolwide programs, sparking increased interest in the students' desire to understand ecology. Administrators set the tone for the school and the district; their leadership creates a cohesive team effort where all players pull together to improve conditions and programs in the school.

MATCH THE MEDIA TO THE MESSAGE

The processes a student uses to move from awareness to action can be stimulated by specific events and activities. While some experiences, such as a week-long residence at an outdoor science school, assist the child in all three processes, some provide exceptional reinforcement of one stage in particular.

These are but some of the ways to forge an enlightened, effective program of environmental education. Others should be keyed to increasing the basic awareness of the subject through the use of films, literature, current events, bulletin boards and even school assemblies, at all grade levels.

Helping students develop a better understanding of the subject matter could be assisted through an outdoor curriculum that takes preschool, kindergarten and elementary students from classroom learning to actual field observations and investigations on familiar territory, the school grounds or nearby local park.

Such first-hand experiences need to become more sophisticated for higher grade levels. For fifth and sixth graders, for instance, more useful application of the basic principles of ecology would be better reinforced with a more concentrated dose of applied learning at a week-long outdoor science school residency. Such an experience for middle grades could be backed up by ongoing research at a field study site. High school students could further sharpen such acquired skills by serving as a cabin leader for outdoor resident science schools, conducting their own field research or even surveying local citizens about environmental problems and attitudes.

The graduation from awareness to understanding culminates when the knowledge and commitment acquired prompts responsible actions toward the environment. When each classroom in every school is based on ecologically sound principles, students are more likely to be both directly involved in and committed to useful, responsible projects that can and should carry over to enlightened community action.

Reprinted from the California State Department of Education materials developed for Earth Day 1990.

PART ONE

Connecting with Nature:

A Self-Empowering Guide to the Out-of-doors

Michael J. Cohen, Ed.D

4-1-8
The roaring hiss of windswept surf
shatters the tranquil moonlit beach.
2-7-2
A fishing boat's ghostly lights float
slowly across the horizon.
2-9-3
The sputtering glow of
lunminescent sand flea dances across
the sand.
1.

My head shakes in disbelief as I speak, then they speak, we exchange ideas, and I finally click the reciever back on this strangely located pay phone here in an isolated Alabama beach parking lot on the balmy Gulf of Mexico.

Magic. I stand near a deserted beach, merely dial ten numbers and a voice from across the continent informs me that my little Earth kinship book *Connecting With Nature: A Self-Empowering Guide to the Out-of-Doors* will play a central role in the Earth Concert, a 1989 live New Year's Eve global television broadcast featuring musicians from all the main cultures of our Planet. Within me a faint disbelieving smile of hope begins to shine as I realize that my long years of wilderness living and teaching may bear fruit for the Planet as well as humanity. What Nature slowly, painstakingly taught me about its secret ways is now to be shared in a worldwide Earth-harmonizing musical convergence so that people may learn to heal our troubled world and themselves.

What I share with you here is an introductory sampling of *Connecting With Nature*'s activities. Try them. They have constantly proved to beneficially enjoin caring persons with the global life community.

Thirty years ago I left my modern upbringing and went to live and work in natural areas as an outdoor educator. I knew that the natural world's design was wiser and more peaceful than anything else I'd ever known. I felt more together, worked better with others and sensed more joy in Nature than in the familiar artificial world into which I was born. It seemed more sensible to ride Mother Nature's full-dimensioned global pulse than modern life's destructive roller coaster.

For the past two decades I have continuously camped out, often sleeping under vibrant rain-washed skies and brilliant winter stars. From my wilderness experiences and the many outdoor education conferences I attend, I have written *Connecting With Nature*, a 40-page guidebook and I present potent workshops on the subject.

In the natural world we do not find the deteriorating stress and destruction all too common in modern society. During my years outdoors, I have found that indigenous people's reverence for Nature develops from bonds that evolve while spending almost 100% of their time in close contact with the natural world. It's the ony world they know and they love it as well as recognize its powerful wisdoms.

On the other hand, average Americans spend over 95% of their time indoors, walled off from the hundreds of signals and callings which peacefully unite the global life community.

By bringing myself and my students into natural settings, I find connections to the natural world. Our activities let us know Nature as Nature knows itself and they produce vital harmonies where chaos formally existed.

Introduction

The statement, "When you pick a flower you trouble a star," beautifully suggests that in Nature everything is interconnected. The great naturalist John Muir substantiated this, noting that in the natural world when you try to move one entity you find that it's attached to everything else.

Today, modern science confirms these observations by recognizing that Earth is a global life system of which people are part. Bioregionalist Frank Traina describes the system as actually being our other body, for biologically, all our life functions are part of Earth's metabolism.

Our relationship to the planet is like that of a newly formed overhand knot in an ancient rope; the rope creates us and flows through us, we embody the rope, we are it. We are only as healthy as is the rope.

In order to be part of a life system (or any system or community), any entity (including a person) must, in some way, be in communication with the system, otherwise that entity will act independently of it. The vital question that this guide addresses is: By what means does the global life system intercommunicate and thus harmoniously regulate itself and its members?

Strange as it may first seem, this Guide empowers modern people to rejuvenate the natural world's communications within themselves in order to find Nature's balance and ethic.

Consolidate - Whenever this word appears write down in your notepad what you feel to be the 3 most important points in the section you have just finished. You will need this information later on.

Consolidate now.

Experiences

Learning Fully. Experience is the best teacher because an experience consists of many ways of knowing. For example, your walk from here to your first trail stop consists of a multitude of thoughts, feelings and actions.

List the variety of diverse signals, tensions and sensations you experience on the way to your first trail stop: color, sound, motion, desires, form, breathing, images, temperature, thirst, exertion, etc.

Your ability to experience the world through so many different senses is part of your biological inheritance. Over the aeons more than 85% of your mind and nervous system evolved with the global life community in order to participate init through shared interconnecting tension, sensation and feeling signals.

Natural Intelligence. At birth, our inherited natural sensation receptors exist throughout our body, are entirely alive and remain so if constantly used. They are a non-verbal, natural intelligence that weakens or dies if it is not exercised. By harmonically exercising and balancing their natural senses, many species and indigenous people rewardingly organize and regulate themselves. Similarly, if we desire to relate more healthfully to Nature, we must learn to accept guidance from the natural world's sentient signals, for its can't learn our language.

Trust Your Feelings. Back to Basics. Check yourself out. Validate that your receptors are in working order by noting that you can touch, taste, smell, hear and see different entities.

Pinch yourself hard and say: "Ouch! I feel, therefore I am." Continue doing this until you can truthfully say: "Feelings are experiences; sensations and feelings are facts." Write this down in your notebook and sign it.

All sentient beings deserve to have good feelings for in nature good feelings indicate ongoing survival. To gain them, sentient beings trust how they feel and actively select for those feelings which are most comfortable. If our more modern intellectual mind doesn't trust our sensations and feelings, we lose valuable data and guidance from our natural intelligence. Your sensations and feelings are important survivalwise because they call your attention to the entities or situations that aroused the feelings.

Consolidate.

Connecting

Go to a natural area.

A. Natural Moods. Within an 80-foot radius of this place, the natural world emits hundreds of signals which send messages to various receptors in yourself. These signals, sometimes called moods, atmosphere, or vibrations, sentiently call to the parts of you which are continuations of them and are therefore most attracted or stimulated by them.

To a greater or lesser extent your sentient self, like that of many other species, recognizes over 40 different tensions or sensations from Nature.

Trust these senses and feelings for they eminate from, endured and grew with life on Earth; they are part of life's coordinating natural intelligence, expressions of the global life community within you.

Familiarize yourself with these 53 senses by reading through the list of them below. Then, while sitting in this area, go through the list again and in your notepad write down the senses that you think are still alive in you. Note that modern people are excessively separated from Nature because we mainly know the world through only 4 of these senses: *sight, sound, rationality* and *language.* That's like hearing a song's words without hearing its music.

The Affinity-Sensation Network

Below are 53 balancing essentials of natural intelligence by which Nature, through consensus organizes, regulates, perpetuates and regenerates itself.

The Radiation Senses

1. Sense of light and sight, including polarized light.
2. Sense of seeing without eyes such as heliotropism or the sun sense of plants.
3. Sense of color.
4. Sense of moods and identities attached to colors.
5. Sense of awareness of on'e own visibility or invisibility and consequent camouflaging.
6. Sensitivity to radiation other than visible light including radio waves, X-rays, etc.
7. Sense of Temperature and temperature change.
8. Sense of season including ability to insulate, hibernate and winter sleep.
9. Electromagnetic sense and polarity which includes the ability to generate current (as in the nervous system and brainwaves) or other energies.

The Feeling Senses

10. Hearing; including vibrations, sonar and ultrasonic frequencies.
11. Awareness of pressure, particularly underground, underwater, and to wind and air.
12. Sensitivity to gravity.
13. The sense of excretion for waste elimination and protection from enemies.
14. Feel, particularly touch on the skin.
15. Sense of weight, gravity and balance.
16. Space or proximity sense.
17. Coriolus sense or awareness of effects of the rotation of the Earth.
18. Body movement sensations and sense of mobility.

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Connecting with Nature (continued)

The Chemical Senses

19. Smell with and beyond the nose.
20. Taste with and beyond the tongue.
21. Appetite and hunger
22. Hunting, killing or food obtaining urges.
23. Humidity sense including thirst, evaporation control and the acumen to find water or evade a flood.
24. Hormonal sense, as to pheromones and other chemical stimuli.

The Mental Senses

25. Pain: external, internal.
26. Mental or spirtual distress.
27. Sense of fear, dread of injury, death, or attack.
28. Procreative urges including sex awareness, courting, love, mating, paternity and raising young.
29. Sense of play, sport, humor, pleasure and laughter.
30. Sense of physical place, navigation senses: including detailed awareness of land and seascapes, or the positions of the sun, moon and stars.
31. Sense of time.
32. Sense of electromagnetic fields.
33. Sense of weather changes.
34. Sense of emotional place, of community, belonging, support, trust and thankfulness.
35. Sense of self: including friendship, companionship and power.
36. Domineering and territorial sense.
37. Colonizing sense: including receptive awareness of one's fellow creatures, sometimes to the degree of being absorbed into a superorganism.
38. Horticultural sense and the ability to cultivate crops, as is done by ants who grow fungus, by fungus who farm algae, or birds that leave food to attract their prey.
39. Language and articulation sense, used to express feelings and convey information in every medium from the bees' dance to human literature.
40. Sense of humility, appreciation, ethics.
41. Senses of form and design.
42. Reasoning: including memory and the capacity for logic and science.
43. Sense of mind and consciousness.
44. Intuition or subconscious deduction.
45. Aesthetic sense: including creativity and appreciation of beauty, music, literature, form, design and drama.
46. Psychic capacity: such as foreknowledge, clairvoyance, clairaudience, psychokinesis, astral projection and possibly certain animal instincts and plant sensitivities.
47. Sense of time: awareness of past, present and future events.
48. The capacity to hypnotize other creatures.
49. Relaxation and sleep including dreaming, meditation, brain wave awareness.
50. Sense of pupation: including cocoon building and metamorphosis.
51. Sense of excessive stress and capitulation.
52. Sense of survival by joining a more established organism.
53. Spiritual sense: including conscience, capacity for sublime love, ecstasy, a sense of sin, profound sorrow and sacrifice.

B. The Connectors. S-E-V-M-R-A-T-C Sense-Enjoy-Validate-Match-Resonate-Appreciate-Trust-Celebrate.

Look around this place and then, in turn, visit the part of it whose mood is most attractive to you with respect to:

color
motion
touch
sound
nurturing
space
temperature
taste
form
smell
place
direction
beauty
community
trust

and others (or continue on your way, stopping to do, in turn, the following activities for each of the above senses at other points along the trail).

C. Further Connnecting. Solos — most environmentally caring people say they gained their strong feelings for Nature from being in natural areas. Solos lasting from a few minutes to a few days may be done in safe natural areas where your presence is not destructive to the land. They provide you with quality time for tuning into the natural world in whatever ways feel comfortable. The fewer technologies that you bring with you on solos, the greater the connectiveness that occurs.

Relaxing helps us more intensely receive and note the moods of Nature because it reduces the demanding language signals and tensions that preoccupy our daily lives.

Relax before doing each of the guide's activities. One effective way to relax is to take a slow deep breath and imagine it spreading slowly throughout your body into your toes and fingers. The rejuvenating air collecs the tensions it touches and you release them when you exhale. Repeat this procedure several times. As you release your tensions into the air, visualize that some other entity is going to inhale them which is OK because one entity's problems are another entity's solutions. That's the way Nature works and why an answer to any problem is always blowing in the wind.

For additional sensitizing activities, read the "Blending Nature and Human Nature Activities" section of *Treating Nature Humanely* by Clifford E. Knapp, available from him at Box 313, Oregon, Illinois 61061.

Consolidate.

Microorganisms

Go to a new natural area. Locate the local moods that most strongly call to you and for each of them do S-E-V-M-R-A-T-C.

A. Ancient Origins. The naked eye can't see Nature's most ancient, profuse and profound organism community yet it still exists today.

Touch, smell and listen to this area in order to sense the soil and various natural entities around you, and then touch your scalp, skin and tongue as well.

Put your ear to the ground and see if you can be sensitive enough to hear the soil's microbial lifeforms interacting. The soil is mostly made up of interacting microorganisms and mineral particles. Can you make that idea so vibrant that you can hear it as you listen to the soil's richness?

Our Microscopic Ancestors — Scientists tell us that everything natural, including ourselves, evolved from, is covered with and utilizes the survival process of minerals, viruses, and microorganisms. When you touch or eat natural entities you make physical contact with your life's original parents.

You see, you are older than you might realize. Although you usually mark your birthday based on the day your human mother gave birth to you, biologically your life is also part of the global life community which was born some four billion years ago. This community still exists, forms and nurtures all life as we know it, including yours.

Aeons ago, minerals and microorganisms like bacteria and varuses organized the planet's environment making possible life as we know it, including your life. In fact, viruses sometimes exist as mineral crystals and at other times they're living cells.

Evolving Diversity — Without using money, words, clocks, mathematics, computers, or modern technologies, during life's first two billion years on Earth, elements, minerals and simple bacteria invented all of life's essentail chemical systems, genetic properties and sensitivities and fermentation, reproduction, photosynthesis, oxygen breathing, and the removal of nitrogen gas from the air.

The cooperative bonding relationships between molecules, minerals, microorganisms and their environments also gave rise to more recent life organs and organ systems. For example: the descendents of bacteria that swam in primeval seas, breathing oxygen 3 billion years ago, today exist as colonies (mitochondria) in all plant and animal cells including your own.

Without these colonies neither plants nor animals can utilize oxygen and live.

In short, each of us is a recombination and expression of powerful multibillion year old microbial-mineral relationships that evolved life's diversity.

The Flow of Life — Every year throughout your life, the processes of the ancient microbial life community around, on and in you replace approximately 98% of your body with new materials from the Planet; within every few years your body's materials are totally replaced.

Our personal bodies consist of ten quadrillion animal cells and another one hundred quadrillion bacterial cells. And when we die, microorganisms change us into our other body, the global life community.

Our Other Body — Microorganism and molecular mineral processes so vitally bond our inner Nature to our Planet, that Earth is actually our other body; without Earth, we couldn't live, for our relationship with it provides us with our sensory and physical being and it safely recycles our excrements.

B. Return to your source. Using your sentient, conscious, natural intelligence powers, try to know your natural life as it knows itself:

In a place free from poison ivy or other dangers, get down on all fours and imagine you are a microbial cell in a living giant. (You are in its atmosphere). Close your eyes. For ten minutes slowly crawl three steps and then, holding your head very still, open your eyes for three seconds. Close them again and repeat this crawling around-eye opening procedure. When your eyes are shut, feel with your hands, feet, body and head. Sniff out this giant, listen, taste, sense it well. Roll on it, rub parts of it against you, inside your arms, feel it with your toes and nose, listen to it with your fingers, suck it into your nostrils, smell the scene; then, drink it in with your eyes, seek the new and different, be its friend, squint at it out of focus, seek different angles, know the grass as a forest for you are part of all of this and vice versa. You are a cell located in this giant's atmosphere, right where it touches its continents.

Enjoy your sensations of the giant called Nature, they are your global sized Earth body touching and nurturing you.

C. Ancient Feelings. Bring to mind your feeling of hunger, thirst, excretion, companionship, community, sex, mobility, suffocation, trust and love. Think about the pleasures you get as you satisfy them.

Neither science nor humanity invented natural feelings and sensations, our other body did.

Acknowledge that your ability to feel is a creation and continuum of the microbially created natural life community that surrounds you in this area. Thank and honor this area for that contribution.

Consolidate.

END OF PART ONE. PART TWO WILL APPEAR IN CLEARING ISSUE 66 (NOVEMBER/DECEMBER)

PART TWO

Connecting with Nature:

A Self-Empowering Guide to the Out-of-doors

Michael J. Cohen, Ed.D

PART ONE OF THIS ARTICLE APPEARED IN THE SEPTEMBER/OCTOBER ISSUE OF CLEARING (#65)

Signals

Go to a new natural area. Locate the local moods that most strongly call to you and for each of them do S-E-V-M-R-A-T-C

A. Develoing Familiarity. In this area we will get to better know our "other body," by further acquainting ourselves with its signals to us and our ability to receive them.

The nature of signals:

1. Look at any object around you and say what you see.

Did you mention that you saw the air between yourself and the object you observed? Probably not, because as we get to know things by only using our sense of sight, we overlook that which we can't see. Now let's attempt to "see" the air on Nature's multifaceted terms rather than using only our sense of sight. Recognize that you are in Planet Earth, in its air, its atmosphere which is as much part of Earth as are its continents and oceans.

Exhale and hold your breath for as long as you can. Notice how you feel a tension building in yourself which asks you to reconnect with your other body, Planet Earth.

Recognize how Earth desires you, how its discomforting suffocation-tension "voice" insists that you breathe and thereby reunite with the global life community.

Feel the suffocation-tension continuing to build in you and then release that tension by inhaling. Sense the glowing relaxation and comfort you feel as you commence breathing again.

Recognize that if you refused to breathe you would become unconscious, at which time Earth would make you breathe again and thus rejoin you to the Earth community. This demonstrates the global community's strong desire for your existence, for it wants you to be, and desires your contributions to its collective welfare.

We are to the air as a fish is to water. Did you know that the words — psyche and spirit — are derivations of the word air? That's why respiration can mean re-spiriting. Have you ever turned to the air for spiritual guidance or as a spiritual leader? Try it.

Tension-Relaxation — Like your tension-building and tension-releasing feelings of suffocation, or hunger, thirst, sleep, excretion, etc., tension-building and tension-release (tension-relaxation) is a basic bonding process by which the natural world communicates to all its entities. Sensation signals (like the list of 53 senses in the Connectors section) are communicated to you through stimulating tensions and relaxations which you experience as varying degrees of comfort or discomfort. In addition, tension-relaxation isn some form is found in every entity, in sub-atomic particles, in weather systems and in Earth and its orbit around the Sun.

B. Sentient Communion. Tension is the fluctuating, signaling pulse of the global life community. It is global communion and in people it often expresses itself as sensations and feelings.

Respecting Life — Thank the Earth for being diverse, vibrant and attractive and for sharing these enjoyable attributes.

Consolidate.

Companion reading: "Voice of a Life System" in *How Nature Works: Regenerating Kinship with Planet Earth* (Stillpoint edition).

Affinities

Go to a new natural area. Locate the local moods that most strongly call to you and for each of them do S-E-V-M-R-A-T-C.

A. Universal Attachments. Attempt to relocate, pick or collect different natural objects in this area and without actually moving them note that each is bonded to being where and what it is. Can you find any entities not subject to some attracting force which affects them? Validate and trust your findings.

Recognize that natural affinity and attraction forces like gravity, magnetism, electricity, tensions and waves bond each entity to its self-organized, pulsating form, position and relationship.

B. Basics of Bonding. Read your list of senses that you made in the Connecting section. Each of these senses is an affinity for some aspect of Earth.

Note how many of your affinities are expressed in you as sensations and feelings. They are real. VAlidate and trust them.

C. Where's Home? Sit or lie in this area for a moment. Relax and let it and your imagination take you to the most attractive time and place in your life, a place where you felt most suported and secure with people and your surroundings.

Recognize that many of your life's desires (affinities) were being consummated at this time and place. Presently, it may be your psychological home, and it can serve as an excellent means to bring deeper affinity feeling and bonding to consciousness. Think of this remembered time and place as being your home, the essence of your fulfilled affinities. Honor this place and its feelings.

D. Affinity Desires. From subatomic particles to weather systems, each and every entity "desires" to relate to other entities, and once relationships form, these relationships further "desire" new relationships. This truism exists on every level of being. For example: sodium atoms have a tension-relaxation affinity for chlorine atoms and when they bond their vibrating tension-relaxation dance sodium chloride (salt) forms which in turn has affinities for other entities. Onsome level, affinity bonds are like attractions, romances, loves, marriages or spirits of the entities involved. They are a pervasive cosmic velcro recognized by scientists, spiritualists, and all nations. In people and other organisms, many affinities are expressed as sensations and feelings.

E. To Be Or Not To Be. Recognize that an essence of Earth and life is affinity, the "desire" to be through the formation of stabilizing attraction relationships which help any entity, including yourself, to be: more fully, stably, and securely. Scientists tell us that tension-relaxation affinities and affinity bonds are universal attractions which make being (matter) possible as we know it.

Survival Emotions. All affinity relationships pulsate because of global tension-relaxation calling to which they must adapt.

F. Uncomfortable Feelings and Reactions. Because Nature's essence is the affinity desire (attraction) between all entities, there are no negatives in the natural world. Negatives occur only when the fulfilling of an affinity is thwarted.

1. Locate and list 5 or more negative or uncomfortable reactions you have to this area. (Example: I am irritated by the nasty weather because it is cold and wet.)
2. Locate and list your affinities that are thwarted by this entity. (Example: I like to feel warm and dry, i.e., I have survival affinities for certain temperature ranges and dryness which are not being fulfilled.)
3. Write down why each of the discomforting, affinity-thwarting entities you found annoy you. For example: The rain makes me uncomfortable because it frustrates my affinity for being warm and dry. (Don't demean the rain by calling it nasty; like everything else including yourself, it is an affinity consummation and has a vital vlue in the global life community, that's why it exists).

Practice recognizing your negative feelings about Nature as your affinities being thwarted in order that other entities might survive, and in time you will learn Nature's patience. Note that personal depression, fear, anxiety or anger are actually signals from your inner Nature; it thinks it is being abandoned, its life affinities denied (Further reading: "Nature Abandoned" in *How Nature Works*.

G. Respecting Life. Can you recognize your personal life and life on Earth as a seamless continuum, a slow, ever-growing and evolving multibillion year-old affinity dance between all entities within and around you? Thank and honor the Natural world for dancing its vibrant affinity dance and sentiently sharing its affinities with you.

Companion reading: "The Affinity Bond" in How Nature Works.

Actions

Go to a new natural area. Locate the local moods that most strongly call to you and for each of them do S-E-V-M-R-A-T-C.

A. Dancing Matter. Since all entities are active tension-relaxation affinity relationships, all entities, including yourself, are actually verbs and should be so recognized.

1. *Identifying Actions* — Symbolically recognize your many sentient relationships with this area as verbs. Although it may feel strange at first, instead of saying, "I like this leaf's color," write or say: "I am coloring with this leaf;" "I am vibrating with this tree;" "I am touched by this branch;" "I am singing with this bird;" "I am being with the land;" etc.
2. *Objects as Verbs* — Refer to the many different entities in this area as verbs by adding the suffix "ing" to them so that, for example, a tree would become "treeing"; water would become "watering"; birds would become "birding"; etc. Do this until it feels comfortable to you. Then describe yourself in the same way.

B. Reality. As civilized people we know our environment and ourselves through language whose nouns tell us that the global life community consists of interrelating materials, such as rocks, blood, chemicals, trees, etc. The natural world, however, is a non-language experience which knows itself through ever growing affinity relationships, many of which we may experience "spiritually" as feelings and sensations. What then is reality? Is it the world of material objects and our modern belief systems, or is it the

Connecting with Nature (continued)

global community of affinities including our sensations and feelings?

Subjective Writing — Describe an environment or entity that appeals to you but don't describe its features. Instead describe it by writing down how you sense it, how it makes you feel, your thoughts, memories, associations and opinions about it. Share your essay with others; this is often a powerful, moving way to write or contact reality.

Respecting Life — Thank and honor this area for organizing perpetuating and regenerating its activities, and for sharing their delights with you in so may ways.

Consolidate.

Companion reading: "Voice of a Life System" in *How Nature Works.*

Qualities

Go to a new natural area. Locate the local moods that most strongly call to you and for each of them do S-E-V-M-R-A-T-C.

A. Oneness. Acknowledge to yourself or a companion that from billions of years of tension-relaxation affinity relationships, the global life community evolved and organized itself. As part and parcel of this process it also evolved your biology, your inner Nature and its ongoing sensitivities to the natural world's affinity signals.

1. In this area's natural entities, find examples of skills, beauty, survival, intelligence, dependability, creativity, ethics, power, friendliness, honesty, nurturing, warmth, cooperation, love, loyalty, independence, trust, freedom or other positive human aesthetics, values or aspirations that natural entities contain.
2. Write three sentences explaining why or how each of three different entities in this natural area contain at least one of the above values. For example, with respect to granite you might write: *"Granite is dependable because it maintains itself during winter and summer."* As shown in this example, be sure to use the structure: (natural entity) is (value) because (explanation).
3. Since your inner Nature and Nature are an unbroken continuum, insert yourself in these sentences by substituting the word I for the natural object appearing in the sentence and then permit aspects of yourself to fit the description. For example, change the sample sentence about granite to read: *"I am dependable because I maintain myself during winter and summer."*
4. Validate your sentence about yourself in 3 by saying aloud that it is true (it must be, see A. above) and by finding examples of it in yourself.
5. If you find that you can't comfortably do number 4, you

HOW TO DO S-E-V-M-R-A-T-C

1. CHOOSE a central point of this area and go there.
2. FOCUS your attention on this natural environment's color mood.
3. SENSE. Check out different parts of your surroundings and move to the area nearby that colorwise seems most attractive.
4. ENJOY. Spend one minute enjoying your chosen place's color. In writing, complete the following sentence: I enjoy this place's color because ________
5. VALIDATE. Acknowledge to yourself that you are a person who finds this particular place's color attractive and enjoys it.
6. MATCH. Match this color with the same color that you might see or feel within you, your own color mood. Write this personal mood in your notes.
7. RESONATE. The color of this place has a certain quality to it which gives you a special resonant feeling. Hum or sing a musical note or notes that express how you feel while experiencing this color. (Also express Resonating through songs, visual arts, poetry and dance.)
8. APPRECIATE & HONOR. Thank this mood which has attracted or called to you for having given you so much color. Honor this place or entity with some physical act, gift, or spoken words. Honor it for its color contribution to the global life community and yourself.
9. TRUST. The state of mind and feeling that you obtain from S-E-V-M-R-A-T-C; it is your natural intelligence expressing itself. Use it often to more deeply acquaint yourself with any area or entity.
10. CELEBRATE. In your notebook write a Haiku verse which expresses your thoughts and feelings about this connecting experience with color. (A Haiku is three line prose whose first line contains 5 syllables, second line contains 7 syllables and third line contains 5 syllables. As an example, for connecting with orange autumn leaves you might write:

Orange morning sun leaves,
Awaken deep within me,
The dawn of being.

11. Return to the central area and repeat this activity with the next sensation listed under the Connectors (temperature, form, smell, etc.).

have probably discovered an area of your natural self that has been hurt, lost or buried in your upbringing. Conscientiously work on regenerating these lost areas of yourself for they still exist in you, but your intellect was trained to feel uncomfortable experiencing them. If you start coming up with negatives, review "Affinities F."

6. In your notes go back to what you have written for "Connectors II" on this trail and read your responses to question 4 which says: "complete the following sentence: I enjoy this place's color because ____." Now put the word "myself" in place of "this place's" so that the sentence read: "I enjoy myself because I ________."
7. Recognize that #4 and #5 above holds true for #6.

Respecting Life — Thank this place and its entities for their qualities, and for sharing their qualities with you.

B. Natural Gifts. Humanity is a recent arrival on EArth in comparison to most other natural entities. Since our Nature is an expression of the ancient global life community, all of our natural abilities come to us from the natural world.

Make a list of 20 plants, animals and minerals that you like. Write down what outstanding skills, talents, or values each of these entities have. For example:

Fox... cleverness, adeptness, nimbleness

Poison Ivy... self protection, climbs trees

Marble... strength and beauty.

Now thank each of these entities for having developed this ability and for having given you and others the gift of this ability.

Consolidation

Companion reading: If you enjoy this guide's activities, you will appreciate the additional 60 activities in *Connecting With Nature* and in the study guides of *How Nature Works*.

Unity

A. Being Naturally. Study the list of 53 senses of CONNECTING, then for ten minutes imagine yourself having no language but instead only having the ability to powerfully feel and act off of the senses listed. In your notepad write down how this felt.

Some people sense that to live in the "uncivilized" natural world is to dance wildly with their kin, the nurturing, fluctuating, affinity-guided global life family. They say the dance is an exciting, fun game and while playing it each participant has the time of their life to the mutual betterment of all. Write down if you agree or disagree with this and why.

B. Integrating Nature. The most powerful, practical, and immediate means to bring the global life community into your daily life is to interchangeably substitute the word Nature for the word feelings and vice versa. For example: to express feeling good say, "My Nature is being supported." to express uncomfortable feeling say, "May Nature is being abandoned." Learn how to develop this vital art by reading pages 126-129 in *How Nature Works: Regenerating Kinship with Planet Earth* (Stillpoint edition).

C. The Fabric of Harmony. People who have strong Earth kinships enjoy the affinity feeling of love and they seek it from other people and from the land. Earth kinship people also feel inhibiting tensions when they excessively encroach upon their natural environment. When they destructively stress the Nature within or without, a flood of discomforting, tense sensations demand that they act differently and these tensions only relax when they behave in more life-harmonic ways.

Try saying "In the same way that I love my family and friends, I am neither afraid nor ashamed to deeply love the land, for I best know peace when I am in tune with people and the wind, the hills and the stars. I have a loyalty to the global life community and am committed to act in ways that enhance it."

Write down how you feel after saying this. Do you experience any discomforting feelings? Which of your affinities are being thwarted?

Feelingful, self-regulating communion and consensus bonding within the global life community creates Nature's harmony. The natural world makes no garbage because natural affinities insist that through sentient balancing (consensus) each entity cooperatively makes room for all other entities' existence in some form.

Respecting Life — Visit a cathedral or other sacred place and there S-E-V-R-M-A-T-C. Can you locate natural affinities in you that this place signals? For what aspects of Nature, if any, have you ever had the same feelings? People who enjoy Earth kinship live their entire lives in the cathedral we call Nature.

Have you been taught to experience your deepest feelings in Nature as reverently as you've learned to express them in cathedrals or other artificial sacred places? Would you destroy these places? Do you act when somebody else destroys them? Your home? Your natural heritage?

Summary

Read through all your consolidations and reduce them to three short sentences.

Read through these 3 sentences asking them what they would like to teach you, then write down your answer to this question in one short sentence. Trust this sentence as a vital goal for your life.

Since 1959, Michael J. Cohen, Ed.D has organized hands-on, consensus-based camping trips that explore in depth the ecology of North America. He is the founder and Director Emeritus of the National Audubon Society's degree granting graduate and undergraduate college, the Audubon Expedition Institute. Presently he independently presents workshops entitled Earth Kinship: The Fabric of Personal and Global Balance and is a Professor of Integrated Psychology at World Peace University, Box 10869, Eugene, Oregon 97440.

Biological Diversity and Old-Growth Ecosystems

> *"The one process that will take millions of years to correct is the loss of species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us."*
>
> E. O. Wilson

Some thoughts on diversity

Diversity, to the human animal, can be a threatening concept. Diverse ideas are often confusing. Diverse peoples present different customs and languages that may be difficult and even maddening to cope with. Diverse choices, say of cars or even television channels, can require more mental effort than we are willing to commit and increase the likelihood of our choice being less than optimal. In a world that tends towards reduction and simplicity of concepts, components and choices, diversity is often purposely eliminated.

In nature, it is often just the opposite. Here the tendency is away from simplicity towards diversity; towards complexity, interdependency and interrelatedness; towards a system of checks and balances; towards a system of back-ups and alternatives.

Because of this complexity, natural systems may be difficult for humans to fully understand. When people and ecosystems come together the favorable parts of the environment are selected, isolated and often enhanced for the immediate short-term benefit of society. This simplification of our environment can have both beneficial and detrimental effects.

The forest resources

In the Pacific Northwest, lush forests have provided a strong backbone to the region's economy. Once, uninterrupted forests stretched to distant horizons and provided the early timber industry with a seemingly limitless supply of wood.

Today, after over 100 years of intensive timber harvest, the forests of Oregon and Washington are still providing the nation with abundant timber raw materials. In fact, the forests of the Pacific Northwest are the leading timber producing region in the world.

Recreational opportunities have also expanded in forest lands. Growing numbers of tourists, better developed recreational destination sites, improved roads, and increased access, have all encouraged a variety of visitors to look to these forests as major vacation destinations.

These demands for a variety of forest products has created a badly scalloped and fragmented forest. Not only are they changing physically, but they ar changing in the replacement stands of forest species.

The wood products pressure

One hundred years ago, virgin timber harvest (old-growth forests) satisfied the demand for forest products. Today, these old forests make up an increasingly smaller percentage of the overall timber harvest. In the future, the ability of our forests to sustain a high timber yield will depend upon forests that people have planted, nourished, and managed for fast growing, high yielding trees.

These younger, faster growing forests are expected to meet the future demand for wood products. To do this, modern foresters in the Pacific Northwest have selected a few of the highest desired wood product species, isolated them in monotypic stands, and enhanced their growth characteristics through genetic selection. They are trying to enhance the growth of these primary forest crops.

Modern farmers plant rows of corn, soybeans, or rye. Without the use of intensive growing techniques, the market demand for these crops could not be met.

In forestry, modern foresters plant rows of Douglas-fir trees. These second-growth, managed forests are planted where old-growth forests once stood, replacing a diverse long lived community with a faster growing and biologically simpler one. These intensive growing techniques help to maximize the value of the land and quickly turn around raw materials needed for the timber industry.

A complex issue

The ecology of the old-growth forest community is now just partially understood. We do know that like most communities the interrelationships between the various plants and animals living in this community are complex. Their lives may have far reaching effects beyond the boundaries of the forest and even beyond the lifespan of any individual species.

The natural regeneration of old-growth forests though can not supply the quantity of wood products that people currently demand. The time required for regrowing old-growth stands is enormous, beyond the conceivable lifespan of any human.

Eventually, managed second-growth forests will meet that demand on a more continual basis. In terms of wood production, managed stands grow faster, maximize land potential, and allow efficient commercial harvest. To the timber industry, a managed second-growth forest is the clear choice for efficient wood product production.

In contrast, old-growth forests grow very slowly, but, can produce very high quality wood.

But what are the effects of replacing a naturally complex system with a managed, simplified one? We have outlined the benefits of a managed forest. These benefits are the basis of a forest products industry that in the short term we are all dependent upon. The detrimental effects of a simplified forest ecology are important and compelling as well.

Biological diversity is essential for a healthy ecosystem and in a broader sense for the health of the world we live in. Biological diversity is the balance between the evolution of new species and the extinction of old ones. It is powered by the genetic diversity of each species. The more genetically diverse each species is, the greater the potential for biological diversity.

In some areas very few species are able to survive because of the extreme living conditions. The arctic tundra or the Oregon high desert are good examples of stressful environments with low species diversity. A disturbance, fire, flood, or housing development, in such an area will impact the environment by eliminating some species, reducing the overall fertility of other species, or changing the environment enough to make it inhospitable to its former inhabitants. Without a diverse gene pool, adaptive responses to counter the stress to the environment are slow and often not possible.

In some areas stable, favorable conditions have led to environments rich in species. A tropical rain forest or the Great Smokies Mountains are examples of highly diverse ecosystems. Here a disturbance is more more easily absorbed by the system through the number of possible alternatives present from the sheer number of species and their diverse gene pool.

It would be similar to stocking your pantry with one kind of soup and one spice and one kind of fruit, etc. If guests were to arrive for dinner you might not be able to offer them a meal to their liking. A diversely stocked pantry though, would allow you to provide a greater number of alternatives that might satisfy your guests.

Are the managed Pacific Northwest forest lands of Douglas fir like the understocked pantry? These forests provide a plentiful resource but are they equipped to handle a disturbance? For example, insect populations whose gene pools are adapting constantly to new conditions, can devastate a monotypic timber stand. In this case we have created a simplified forest system where the checks and balances of natural insect control have been severely reduced. Infestations by bark beetles and bud worms are two examples of a reduced biological balance. In a natural forest these insects are kept under control by an interrelated web of prey and predator species. Carpenter ants and spiders help to naturally control the budworm population.

Without such natural controls the forester must intervene by spraying, cutting, or burning, usually at great cost, to try to control the insects. The rapidly adaptive genes of insects make these efforts successful over the short term but often unsuccessful over the long term.

A biologically diverse ecosystem is a healthier and more stable ecosystem because it has the ability to adapt to disturbances.

The demands for forest products, the economic constraints, and our current management practices are enhanced by a monotypic crop of trees.

It is the balance between these three aspects in the short and long term that will determine the biological and economic health of the Pacific Northwest forest.

Reprinted from Old Growth Forest Management Curriculum, Oregon State University Forestry Media Center.

~ Activity ~

Exploring Diversity

K-5 — Use materials found naturally in an old growth forest for "feel boxes." Perhaps your local nature center can help by loaning you materials. Examples might include a feather, bark, moss, a branch with shelf fungus on it, different cones and different size needles. Have the students put on a class play about old growth forests. Some of the students can play snags and logs while others can be insects, beetles, small rodents, fungi, etc. that are dependent on the snags and logs for their survival.

6-8 — Play Wildlife Jeopardy. Create "Jeopardy" questions pertaining to old growth forests. The questions are posed as the answers, such as "Forests containing the world's greatest amount of biomass." The correct answer would be "What are old growth forests of the Pacific Northwest?" Split the classroom up into three teams. Play the game with you asking the questions. Keep score on the board.

9-12 — Have your students design and make a class bulletin board with a left to right view of succession in an old growth forest. In the later stages show lots of snags and logs.

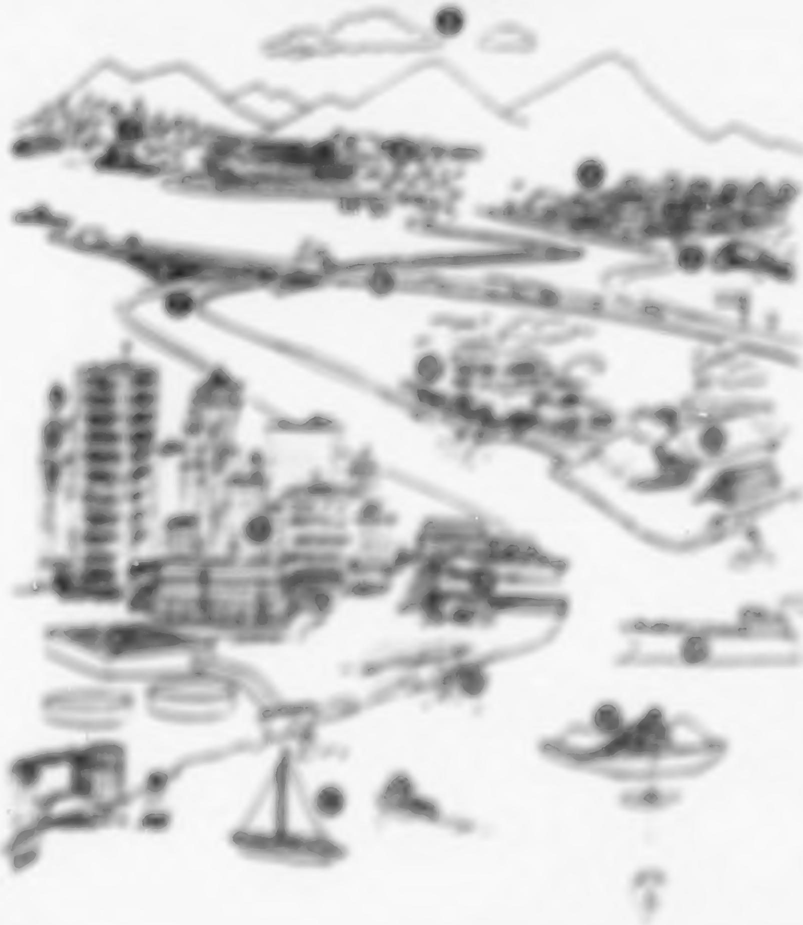
from "the Wild, Wild World of Old Growth Forests" an activity guide written by Suzanne L. Rouse and published by the Wilderness Society.

Resources

The Wild, Wild World of Old Growth Forests. Published by the Wilderness Society, © 1989. 1400 Fourth Avenue, Suite 810, Seattle, WA 98101. (206) 624-6430. Writer and Editor: Suzanne L. Rouse. For more information, contact the Wilderness Society or the Washington State Office of Environmental Education, 17011 Meridian Ave. N., Seattle, WA 98133. (206) 542-7671.

Old Growth Forest Management. Published by the Forestry Media Center, Oregon State University, Peavy Hall, Room 248, Corvallis, Oregon 97331-5702. (503) 754-4702. A Teacher's Package contains briefing papers, fact sheets, teacher's manual, study cards and glossary. A slide tape accompanies the package.

Puget Sound... Half Full, or Half Empty?



Mark D. Plunkett
The Seattle Aquarium

"Pugetopolis" vs.
Growth Management...
Old Growth Forests vs. loggers...
"Herschel" vs. steelhead...

As we enter the final decade of this century - the "environmental decade" - there appears no lack of blood boiling controversies to stir the passions of Puget Sound residents. Have we progressed in the 80's to the point of offering hope for the 90's? Perhaps a summary of the key environmental issues facing the Sound today would serve to put the issues we face into perspective.

In a 1988 Clearing article entitled "Puget Sound Pollution" (Plunkett, et al), the focus was upon "pollution." Topics covered included toxic contamination of sediments, municipal wastewater treatment and bacterial contamination of shellfish. The primary difference between then and now is the need to: 1) update and prioritize our responses to water pollution and 2) to recognize the threat to the ecological integrity of the Sound from our often unwise land use and marine resource management decisions. This article shall provide a brief update of those topics discussed in the 1988 summary, followed by a discussion of environmental issues deserving attention today.

Toxic Contamination

Often the first place a person considers in water pollution is an industrial discharge pipe. Toxic contaminants represent the most acute and greatest long term threat to the habitats and biological resources of the Sound (Puget Sound Water Quality Authority Report, 1988). Recent research has documented a higher percentage of reproductive abnormalities, tumors and fin erosion in bottomfish sampled in or near the Sound's industrialized areas such as Elliott Bay (Seattle), Commencement Bay (Tacoma) and Eagle Harbor (Winslow). Fortunately these problems appear to be localized near the sources. Improvements in point source discharges via stricter permit limitations and enforcement, plus increasing industrial recycling and pre treatment have significantly reduced the discharge of some toxics into the Sound. Aggressive actions spearheaded by the 1989 Urban Bay Toxics Control Program EPA, et al. offer hope for further improvement. After nearly a century of degradation the changes are slow coming. Only time will tell whether the cumulative impacts of decades of disregard will yield to recent enlightenment.

Municipal Wastewater Treatment

In 1988 the debate over how to discharge the 200+ million gallons of human sewage into the Sound was coming to a close. Congress extended a deadline from 1972 to 1988 for the upgrading of this country's sewage treatment from "primary" to the more advanced "secondary" technology. In 1988 approximately 25% of the Sound's facilities were still functioning at a primary level. Scientific and economic data suggested that "at "special primary" treatment could mimic the results of secondary at a fraction of the cost. However, exemptions based on such arguments were turned down as state monies and federal dollars to assist in the construction of upgraded facilities were fast drying up. Secondary treatment will be the norm by the mid-90's. This should reduce the discharge of toxic components in sewage into the Sound. Pre-treatment of toxics by industry before discharge into the sewerage systems, and decreased discharge of combined sewage/stormwater overflows ("CSOs") are additional improvements anticipated. It is expected though that sewer rates will rise dramatically to cover the cost of secondary conversion and the added sludge produced from secondary — twice that of primary — will add to the burden of solid waste management on land.

Shellfish Contamination

Significant strides in the past decade have been made in responding to toxic contamination and sewage treatment. This, however, is not the case for the bacterial or viral contamination of clam, oyster and mussel beds. The Puget Sound Water Quality Authority estimates the retail value of shellfish safe for human consumption is greater than three million dollars per year. Recreational use to thousands of non-commercial collectors can be added to that. Although discharges from sewage treatment plants and industry contributed to shell fish closures in the 1960's, the situation worsened in the 1980's. From 1981 to 1989, roughly 30% of the Sound's commercial beds were damaged by bacterial/viral impacts. Some areas were totally or intermittently closed, stretching from Port Susan north of Everett to locations in the South Sound and Hood Canal. This most recent wave of contamination is associated with fecal matter from so-called "nonpoint" sources including: 1) livestock practices that permit discharge of animal waste directly or indirectly into streams close to the Sound; 2) failing septic tanks/drain fields; 3) improper discharge of waste from marinas and/or boats and 4) high concentrations of seals and sea lions. Though the shellfish industry (and perhaps some recreational collection) is presently in jeopardy in some locations, positive steps are being taken. The Water Quality Authority and Department of Ecology are implementing shellfish protection strategies with the cooperation of county and local jurisdictions. More restrictive land use ordinances to protect water quality, and increased agricultural and boater education are some of the measures that offer hope.

Oil Pollution

The joy of Christmas 1988 was clouded for many with the news of a ruptured oil barge off Grays Harbor, Washington. The grim details eventually unfolded — 231,000 gallons of heavy bunker oil that spread north, predominantly coming ashore in "carpets" of crude and tarballs up to and beyond the pristine Olympic National Park. Though the 1985 Arco Anchorage spill of 239,000 gallons was rated as the state's largest spill by volume, the December '88 spill covered a wider area and resulted in greater destruction. Tens of thousands of seabirds perished despite the valiant effort of cleanup/recuperation teams. Just months later, the largest spill in U.S. history — nearly 11 million gallons — spread its agony over Prince William Sound in Alaska. Though Washington had experienced four major spills in the 1980's, it was the Alaskan carnage that catapulted oil spill prevention to the top of the water quality agenda locally. Residents were shocked to learn tankers carrying roughly four times as much oil as was spilled by the Exxon Valdez legally ply the waters of Puget Sound. A recent Coast Guard study cited a staggering 15 billion gallons of oil and oil products were transported in that area in 1988 alone. An acknowledged lack of spill response equipment and training is the rule locally despite the huge risks inherent in transporting this volume of fossil fuels. A clear need for the 1990's is a comprehensive and coordinated plan replete with budget, training and expertise to respond to future spills. Perhaps more importantly though, prevention must be emphasized. A "blessing" of the Alaska disaster is a resolute and energized national debate on the merits of double hulls, increased tug escorts, [illegible] and other spill prevention solutions. The state of Washington has recently formulated plans for a consortium of spill prevention/clean-up strategy. Implementation is needed now if there is to be a ray of hope in handling the Sound's petroleum cargos safely in the coming decade.

Marine Debris

The final pollution topic that deserves a fresh new look in the 1990's is the increasing volume of garbage and debris in the ocean. While Puget Sound and Washington state numbers are sketchy, estimates are that worldwide a staggering 6.4 billion tons of marine debris is disposed into the ocean per year. A Japanese study in 1988 reported the highest concentration of marine debris to be in the North Pacific, with some of the highest levels off the Washington coast. Approximately 80% of all marine litter is associated with merchant vessels such as tankers, barges and container ships. The balance is contributed from commercial fishing fleets (particularly lost fishing nets and gear), cruise ships, military vessels, recreational boaters and the land.

The precipitous decline of northern fur seal and northern sea lion populations off Alaska is partly attributed to entanglement in marine debris. Dozens of species of seabirds have been reported entangled in debris

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Resources

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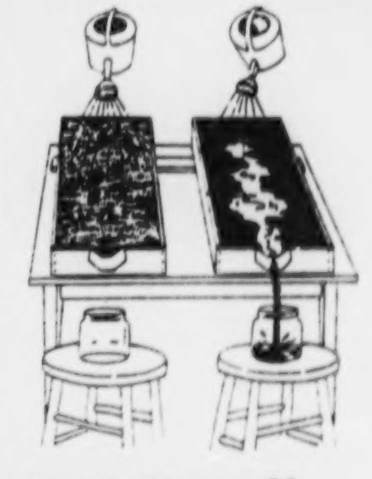
Activity



Don't Runoff

7-12 - Will vegetation protect the soil's surface from erosion? In this investigation you will demonstrate how ground cover affects erosion by comparing the effects of falling water on vegetated and nonvegetated soils.

1. Prepare two boxes as directed by your teacher. Refer to the diagram on the left.

2. Set both boxes on a table so the spouts extend over the edge. Place sticks under the opposite end to give the boxes slope. Both boxes should have the same slope.

3. Fill both trays with soil from the same place — not grass, just soil. The idea is to have the same kind of soil in both boxes.

4. Place the empty jars on stools placed beneath the spouts of the boxes.

5. Cover the soil in one tray with sod (or grass clippings)

6. Fill two sprinkling jugs with 1/2 gallon of water each. Holding each jug about one foot above the boxes, sprinkle water onto the soil at the upper end of both boxes. It is important to pour the water from the same height and at the same steady rate.

7. Collect water in both jars for five minutes. If necessary, adjust the collection time for the soil and slope you are using.

8. Compare the amounts and clarity of water in each jar.

-from The Stream Scene, an aquatic education program distributed by Oregon Department of Fish and Wildlife.

Activity

Oil on Water

Grades 4-6

1. Obtain an aluminum pie plate or similar container. Place about one inch of water in the plate.

2. Use an eyedropper to place 15 to 20 drops of salad oil on the surface of the water in the dish.

3. Use the following tools to try and cleanup the oil: cotton balls, spoon, eye dropper, nylon netting, styrofoam, cardboard, string, straw, detergent, nylon hose. Use a watch with a second hand to determine the amount of time it takes you to clean up the spill.

4. Repeat the simulation using three different techniques.

5. Now use motor oil and record your results.

6. Simulate bad weather by making waves on the surface of the water. You can do this by blowing gently on the surface or using a card through the water. Which method was most effective?

-from "Turning the Tide" Teacher's Guide, developed by the Washington Office of Environmental Education.

Activity

What Can I Do?

In Your School (K-12):

Call 1-800-RECYCLE to find locations and information about recycling. Make it an all-school event to inform parents and neighbors about waste disposal alternatives which are locally available.

Recycle all used paper at school, including duplicator copies and students' classroom assignments. (For reference see A-Way With Waste, Washington State Department of Ecology).

Raise money for a class field trip by recycling or by selling products made from recycled material.

As a class, adopt a stream or a beach by calling: (206) 259-9488 or (206) 344-2544.

Restore some portion of your watershed (where erosion has occurred) and provide more habitats for wildlife by planting native trees and shrubs. For information call the WA Department of Wildlife.

Participate in the Northwest Association of Marine Educators (NAME - see information in this issue of CLEARING)

Puget Sound Activities

How do these various contaminants find their way into Puget sound? Use the picture at the beginning of this article to connect the description to the appropriate number. -From Poulsbo Marine Science Center.

____ Atmospheric sources include lead and hydrocarbon exhausts from automobiles, and gases and particles from factory and power plant chimneys which enter the water directly or are carried by runoff.

____ Runoff from suburban and rural residential areas carries fertilizers, pesticides, particles eroded from soil and shorelines, and animal waste.

____ Shipbuilding, drydocks, and other marine industries contribute metals, organic chemicals, and other ship-related debris.

____ Municipal sewage treatment plants discharge large volumes of treated wastewater.

____ Forestry and logging contribute contaminants from soils re off roads and clearcuts, and from herbicides.

____ Landfills can contaminate surface water and groundwater with virtually every material used and disposed of in society.

____ Recreational boating contributes fuel, sewage, and refuse spillage.

____ Waterfront industries discharge a wide variety of contaminants to rivers and the Sound.

____ Rivers, though not the source of contaminants, carry them into the Sound. The contaminants enter the rivers as direct discharges or as runoff.

____ Surface runoff from urban areas contains contaminants from streets and motor traffic, commercial and industrial activities, and human and animal inhabitants.

____ Runoff from commercial and domestic agriculture carries fertilizers, pesticides, particles eroded from soil and shorelines, and animal waste.

____ Highways are significant sources of hydrocarbons, metals and contaminated particles.

____ Shipping can be a source of spillage or discharges of cargo, fuel, sewage, and refuse, and of metal contamination.

____ Dredging and dredge spoil disposal redistributes contaminated particles

____ Waterfront forest products industries, such as pulp and paper mills and log-shipping yards, discharge wastewaters to the Sound.

____ Combined sewer overflows (CSOs) combine surface stormwater runoff from urban and suburban areas with sewage and industrial wastewater and, during heavy precipitation, discharge some of it directly to the sound without treatment.

The Endangered Phoenix: Lessons from the Firepit

Charles E. Roth
Director of Education Services
Massachusetts Audubon Society

It sustains us all — whatever our race, creed, nationality, political persuasion, or even our species. Aldo Leopold called it "the land;" James Lovelock, and the early Greeks refer to it as Gaia; Native Americans knew it as Mother Earth; many scientists describe it as the biosphere. By whatever term it is known, it provides all the conditions for life and we are all living integral parts of life itself. It is the "environment" we refer to in the term "environmental education."

It is difficult to conceive of anything much more basic about which to become educated than an understanding of how the systems of life function and how we humans fit into them. However, because we are so intricately enmeshed in the multi-dimensional, multi-faceted tapestry of the environment it is apparently easy for a majority of people, including educators, to take it for granted. In addition our culture's strong tendencies to anthropocentrism tend to put additional blinders upon our educational leadership. The end result is that environmental education is generally relegated to a minor role, if any, in most educational programs.

There is nothing new in all that. Spokesmen for putting education about the relationships between people and nature to the forefront of education have been around essentially since the beginning of civilization. Whatever the culture, it seems there have been those who spoke for better understanding of relationships between people and the natural system in which they were embedded. Sometimes these visionaries spoke out through religious systems, at other times through secular writings and educational programs. But rarely have their views been widely accepted into mainstream areas of the culture.

Instead a spectrum of other views that more comfortably addressed human dreams and insecurities held sway. Despite considerable diversity, most of these views share in common a strongly anthropocentric world view and a disregard, if not outright contempt, for the natural world and its intricate, complex life support systems. When human populations were relatively small and widely scattered, the negative impacts of the consequences of such human behavior were slight and local and the redundancies and scale of the global ecosystem made them relatively forgiving of such trespass.

But times have changed. Today human populations are extensive and concentrated. Negative impacts are increasing and intrusive into some of the most fundamental functions of what has been an essentially self-regulating global environmental system that fosters and is fostered by its myriad forms of life. And of course, the rate at which such changes are occurring is apparently without precedent in the history of life on this planet. It's a change rate in excess of that required for many ecosystems to adjust their self-regulating mechanisms through normal evolutionary processes. The overall set of systems inevitably is becoming less forgiving.

...Cultural diversity gives rich flavor to humanity. It must be pre-

The Endangered Phoenix: Lessons from the Firepit
(continued)

served. As with the lumps of meat and vegetables in a good stew, the cultural lumps give character to the totality of humanity, but in a good stew the lumps share a common broth. For us that common broth is a healthy biosphere and that can only be achieved through healthy ecosystems around the globe, a situation we do not enjoy at present. Culturally, it would appear that the common broth has to come from environmental education at the core of each culture's multi-faceted education system. In the real educational system schooling is only one component: it is a system that includes the family, the media, the community, religious groups, various interest groups such as scouting, clubs and the like, and even the workplace. For educational messages to become normative in a society, the individual has to be receiving them from several segments of the system, not just one.

> Daily, intimate contact with living systems encourages, but does not guarantee, feelings and understandings of our total interconnectedness with natural systems.

To effectively nurture a culture, or mix of cultures, the common educational broth must include a rich blend of positive feeling for, and understanding of, the complex systems of life that result in moral, ethical guidelines that foster activities that maintain and restore every area's capacity to sustain life in diverse ways. That such a need, indeed demand, strikes to the heart and core of each culture is clear. That the attempt must be made, and vigorously, there should be no doubt. That it can be achieved is less clear. But there should be no doubt that environmental education organizations will have to face the challenge and reexamine priorities and strategies.

We need to face the fact that we have to become more radical. Radical, not in the sense of wildeyed, crazy viewpoints, but in the sense of returning to roots, which is what the word truly means. We are rooted in the system of life, all of us, and whatever else we may be or do, we had best take care of that system first and foremost. Only then can we safely and reasonably take on other ventures. We must help the educational establishment realize that reading, writing and arithmetic are only tools, indeed only some of the tools, for understanding the natural systems that sustain our diverse lives. Throughout history there have been numbers of cultures, indeed many Native American ones, that have possessed better understanding of the living systems and their place in them than ours does, yet have been totally unfamiliar with the so-called basics of the 3R's.

Daily, intimate contact with living systems encourages, but does not guarantee, feelings and understandings of our total interconnectedness with natural systems. In a continual chicken-egg dilemma, minds must be prepared to perceive and accept such connections and their implications.

...At a time when America is looking hard at education — what it is and is not doing for its people — the time is ripe for environmental educators to move aggressively into the dialogues and help the public and the educational establishment see how the ideas environmental educators have been wrestling with can be incorporated into the very core of a revamped educational system that can appropriately serve our people and nations in the years ahead. This involves not only gaining understanding about the living system of nature but the fostering of strong positive self-concepts and a sense of community that allow people to act positively in relationship with other people and the natural world. Education must not be confined to helping people make a living but must also help people to live rich, satisfying lives. Education can help people foster the beauty that is a result of the basic order that exists in Nature, an order which requires continued investment of energy to maintain. ...The ultimate goal of our educational system must be a citizen that lives all facets of life in a manner that is humanly successful yet ecologically sound.

Why so? Simply because the quality of our environment is essentially the net sum of the consequences of individual and corporate actions. These actions are the direct result of our individual activity as producers, consumers, recreators, procreators and voters. It is important that as broad a segment of the population as possible be capable of, and willing to make enlightened choices. We are all in the system together and each species' follies and fortunes have their impacts on all the rest. Effective educational programs need to see that this reality, and its implications for our lives, is clearly transmitted to all people.

Despite the fact that environmental education currently exists as a discrete entity, it will become truly successful only when it disappears as such through incorporation of its precepts into the basic fabric of elementary and secondary education, the core studies of post-secondary liberal education, even continuing adult education. At first reflection this suggestion may appear unrealistic, but nothing less will lay the proper foundations for a citizenry that can continue to successfully survive and thrive within the ecological constraints of this planet. Such a general education core constitutes the base of true, universal environmental education, the first line of investment in a future.

In the forest of education, the time has come for environmental education to make a successional move from being a rare, though attractive, little understory dweller to becoming a dominant in the forest community. Throughout much of America's history, environmental education, and its intellectual antecedents, was a mere seedling expanding its philosophical root system but gaining little height in the intellectual forest. In part this was because its development was often set back by the anti-environmental forces of greed and ignorance in society. However, in the late sixties and early seventies EE was able to make a growth spurt — but it is still far from being a dominant in the forest. Indeed, in the eighties it may be facing a period of ultra-conservative drought that is arresting its development again.

The intellectual seedling that was to become environmental education struggled for its existence in the shadow of a number of dominant societal ideas that have fostered the extensive disruptions of living systems throughout the world, disruptions that were apparent to a great many people by mid to late 20th century. These environmental disruptions changed the intellectual climate and setting the stage that led to the EE growth spurt that has been alluded to.

The basic need for environmental education has always been present in society. The problems has been to get people to see its value and necessity and to give it appropriate priority. While the impacts of environmentally degrading human activity remained relatively small and dispersed, they tended to remain unperceived, except by a handful of particularly sensitive and perceptive individuals. Thus requests to educate about what was happening to the Earth, and ultimately to us as well, seemed to most people in western societies frivolous at best.

Ironically, it often takes the presence of a life threatening disease, such as cancer, to get a person to stop and examine life and come to grips with what is truly important and what is not. Similarly it may be that the more extensively life threatening disease of environmental degradation may be causing significant numbers of people to stop and examine where our society is heading and determine what things are truly important and which are not. Perhaps the growing communal awareness of the increasing ill health of our environment will lead to growing support for environmental education as a core of our overall general education efforts.

Just as many children rebel against their parents at some time or other, for the past couple of centuries humankind seems to have been rebelling against the parent biotic system, Mother Nature if you will, as blindly as our children rebel against us. In time our children usually change and acknowledge the appropriate wisdom they had earlier denied. The time is overdue for humankind to cease its adolescent, ego centered ranting against the planetary parent and develop a mature grasp of its integral, yet important role in the overall systems of life.

The Egyptians had a myth of a great and beautiful bird called the Phoenix. This bird lived for 500 years, then it set itself on fires and burned to a pile of ashes. From those ashes emerged a brand new phoenix as beautiful as its predecessor. This bird, sacred to the god Osiris, became the symbol for immortality. Throughout history people have sought the phoenix and what it symbolizes. But the phoenix has remained elusive — an endangered species. Occasionally people have found clues that led them to proclaim that such immortality was possible and a broad segment of the populace have wished to believe in the phoenix and what it symbolizes even though hard evidence has been impossible to come by. Those who live with the myth of the phoenix seem to feel that even if we destroy ourselves we can rise from our own ashes as gloriously beautiful as in the past.

The Greeks on the other hand believed in the Earth as a living entity, as did a number of other early cultures. The Greeks called this entity Gaia or Ge. This was long considered a myth as well. But as we learn more and more about the evolution of life on Earth and the complex operations of this planet, particularly in comparison to other planetary neighbors, the evidence increasingly supports earlier intuitional belief in Earth as a self-sustaining living entity. Its self-sustaining systems must remain intact for there is no evidence that Earth, like the mythical phoenix, can arise from its own ashes as beautiful as before, although Earth has survived several mass extinctions in the past eons and, in a phoenix-like way, the DNA of the surviving life regenerated new, long-lasting life forms each time.

We need to learn to accept our place as a fascinating subsystem of a beautiful planet and self-regulate our species so that we do not become the spark that ignites a self immolation of Gaia, for Gaia is no phoenix. Gaia would not arise from the ashes as beautiful as it is at present. At best it might retrogress to the dawn of life when bacterial mats were the dominant life forms and the developers of the basic life processes of Gaia, but it is just as likely that Earth would become as lifeless as its sister planets of this solar system.

Organized environmental education has a major task ahead to initiate restoration of the revitalized myths of the Mother Earth, Gaia, or whatever pseudonym is most appropriate for the idea that the surface of our planet itself is a complex living system in synergistic relationship with inorganic components of the planet.

People need to be brought to a full awareness that they are part of something far larger than humanity itself. While most western religions regard humans as less than God, they still perceive mankind as greater than other species and nature in general and the fallacy of humanism has been that it puts people clearly at the center of the universe. Meanwhile, intuitions, held by a variety of less dominant cultures, of

> ...environmental education... will become truly successful only when it disappears as such through incorporation of its precepts into the basic fabric of elementary and secondary education...

The Endangered Phoenix (cont.)

people as part of a greater system of life in nature are being confirmed by revelations of scientific investigation in a number of fields — ecology, molecular biology, biochemistry, climatology, oceanography, to name a few.

... The curse of mankind, it would seem, has indeed been the biblical one of eating the fruit of the tree of knowledge, for by developing aspects of knowledge we have learned how to circumvent some of these self-regulating mechanisms, something other species have not learned to do. In so doing, we have developed the ability to become a cancerous tumor within the body of Gaia. Indeed, some might suggest we have already metastasized in the system.

The key to a remission, it seems to me, lies in further use of the fruits of knowledge to develop cultural self-regulation of our species in ways that reduce our negative influences and restore our position as a positive component of a healthy Gaia. Education is the key to accomplishing this, education that develops in us a self-awareness of our place in the healthy Gaia and helps us find ways to express the other capacities of our species, and of individuals within it, without jeopardizing the health of the planetary living system.

> One way or another we are going to have to get as involved in the politics of education as many have already been in the politics of environmentalism.

For everyone, survival is primary — food, water, shelter from adverse elements are first needs. Until these are secured we cannot explore adequately the other potentials of either individuals or the species. Provision of these basics is only possible equitably, and for the long run, from healthy systems in a healthy biosphere. Education to achieve this for humans, whether called environmental education or something else, must become Priority One now, not years from now. In the 1970s, our American Commissioner of Education call EE "Education That Cannot Wait," yet it continues to languish in most places.

In 1975, John Disinger suggested, quite accurately, that "Commitment is what has been, and is, lacking." A dozen years later that statement still holds and is further complicated by general lack of real commitment to education among the public apart from what Leopold referred to as "letterhead pieties." In all fairness, in the past several years there has been an honest surge in interest and commitment to general education but by and large the commitment to a strong environmental component of education is lacking.

As an idea or movement EE has passed puberty, even endured some rites of passage. It is not difficult to spot some of the cocky, self-sure attitudes in the profession which are prevalent at the adolescent stage of many individuals and organizations. But, as with the developmental tasks that face individuals of two score plus years in our society, the tasks which lie immediately ahead for environmental education would appear to be career development and mate recruitment. For EE the career development task is to clarify the directions we must take to be fully recognized and respected in society at large. The mate recruitment task involves the courtship behavior that may wed our environmental and educational perceptions to those of society's educational leadership. We already have many of the basic skills needed to make the marriage work, what we need now is to find the words and approaches that will make our suit clear, appealing, indeed irresistible to our potential mates.

There is a strong tendency for those engaged in environmental education to be much more strongly versed in the environment than in education and to be more involved in the politics of the environment than the politics of education. And by education I mean far more than schooling. This has been one of the major factors that has restrained the advance of environmental education, in North America at least. We must all become involved in more than the technology of instruction and look at the politics of how ideas are included in the basic core of true curricula — that is, the basic ideas and concepts with which learners will be encouraged to wrestle during their involvement with educational programs at all levels and both formal and non-formal.

One way or another we are going to have to get as involved in the politics of education as many have already been in the politics of environmentalism. We will also have to make environmental advocates a party to our suit, getting them to understand that environmental education itself is as much of an environmental issue as pollution. Environmental advocates have a tendency to get lost in what they perceive as immediate pressing issues and claim that they don't have time to work on more long-range issues. We have to help them see that lack of general environmental education means a populace that is continually generating environmental brush-fires and undermining earlier environmental progress. Lack of environmental education is thus good for their job security but defeats their basic mission.

The mythical phoenix was able to rise from its ashes because the fire was great enough to leave some live coals that could spark a rebirth of the fire of life. As environmental educators we have all been active firemakers. We go about creating little piles of educational and emotional tinder and setting them alight. Then we tend to go off and start a new fire elsewhere. All too seldom do we return in time with kindling and logs to fuel the little fire we have started or to pull all the little flames we have triggered together to reinforce one another. Fire building is just what it says, a building process and that is both a science and an art. Piling up a random set of tinder, kindling, and logs in a haphazard way, lighting it, and walking away seldom results in a good fire. A good fast starting, long burning fire needs to be carefully designed. You begin small with dry tinder and kindling, then add fuel carefully selected for size and quality and placed in ways that allow good draft.

Building the fire of demand for environmental education in society takes no less care.

From the proceedings of the 1987 Conference of the North American Association for Environmental Education.

Worldwide Ozone Trends and Effects

Bruce Miller
Sea Grant, University of Hawaii

There is now widespread agreement that stratospheric ozone depletion is real. The March issue of Science magazine states that there has been a 5% worldwide reduction in ozone over the mid-latitudes since 1980, and loss over the poles reaches more than 50% during parts of the year. Once the ozone layer is gone, there is no known technology available to repair the damage. Nature repair will take more than a century. Many scientists feel that ozone depletion is the most serious environmental threat, next to nuclear war, facing our planet today.

We all know we have to act; the question is how fast to act. Primarily due to industry pressure at the federal level, the US has taken little action for the past decade... a time in which ozone depletion went from theory to fact. The present ozone hole over the poles, and thinning of the ozone layer worldwide, result from releases of CFCs and other ozone depleting chemicals that occurred more than 10 years ago. We won't know the extent of the damage caused by current releases until well into the next century. By that time, it could be too late to act.

The most immediate impact of ozone depletion is on health. A recently released study by NYU Medical School found that the rate of malignant melanoma, the most dangerous form of skin cancer, has increased of 1 in 1500 people in 1935 to 1 in 120 today. Because of ozone depletion , this rate is expected to be 1 in 90 by the year 2000. Recent results of the Kauai Skin Cancer Registry show non-melanoma skin cancer rates in Hawaii's Caucasians to be at the near-epidemic level of 1 case per 100 individuals.

In addition to cancer, recent studies released by the Manhattan Eye, Ear and Throat Hospital show a direct correlation between ozone depletion and retinal burn in children and young adults. This new finding adds to the already serious burden of UV-induced cataracts currently developing in older individuals.

The major industrial nations have now agreed to phase out all ozone-depleting chemicals by the turn of the century; however, because we cannot risk the social, environmental and economic consequences that may result from continued ozone depletion, we must urge both state and federal governments to take effective action sooner to prevent unnecessary CFC releases into the atmosphere. We must also take personal action such as avoiding halon fire extinguishers and certain foam plastics that are made with or contain CFCs. If we can't avoid using other ozone depleting chemicals, such as freon in air conditioners, we can insist that our appliances are repaired using capture and recycling equipment.

In closing, here are a few quotes for your consideration:

"If our ozone layer is depleted, one could imagine a future situation where despite maximal sun avoidance and screening, people in their everyday activities alone might receive enough radiation to develop skin cancer."

Dr. Darrel Rigel (1988),
NYU Medical Center

"The long-range implications for ozone depletion are obscene. No more weekends at the beach. No more rounds of golf on a pleasant afternoon. No more endless hours on the ski slopes at Vail. No more idle hammock time in the all-too-insubstantial shade of an oak or an elm.

It doesn't take a vivid imagination, given significant depletion of the ozone layer, to envision the evolution of today's sun worshippers into nocturnal beings who seek the dark as though their lives depend upon it... as well they might."

William Hines (1987)
Science Correspondent,
Washington Post Health

The trend lines are clear. Stratospheric ozone is disappearing at an increasing rate and we are beginning to see its effects. While we don't know how severe the situation will become, potentially grave consequences suggest we act now at local levels to restrict unnecessar/ releases until the federal ban is in effect. The price for not acting, as suggested in the previous quotes, may be too high to pay.

Natural Formation of Ozone

The ozone layer is photochemiclly produced when ultraviolet radiation (UVR) interacts with an oxygen molecule, splitting it apart, into two oxygen atoms. The newly liberated oxygen atoms combine with other oxygen molecules to form ozone, a gas composed of three oxygen atoms (O3). Generally, the greatest concentration of ozone occurs in the stratosphere at an altitude of approximately 15 miles. Ozone can also be created at ground level during a photochemical reaction between UVR and air pollutants, during a lightning storm, or even when oxygen comes in contact with leaking power lines (Rosen, 1989). Ground level ozone is detrimental to health, but stratospheric ozone is essential to life on earth.

The stratospheric ozone layer absorbs dangerous UVR, and in the process causes the temperature in the stratosphere to rise with altitude. This relative increase in temperature results in a thermal inversion, with warm air above the cold. This situation confines the dynamics of "weather" to the troposphere (Rosen, 1989), and is responsible for the maintenance of a stable global climate.

Ozone Depletion

Grade level: 5-9
Subject: Earth and Life Science
Concept: 1. Shorter wavelengths of light such as ultraviolet can harm living organisms
2. The ozone layer protects living organisms from dangerous doses of ultraviolet radiation.

Course Goal: Students can demonstrate the destructive properties of UV Light and demonstrate protection from the ozone in the stratosphere.

Time Required: Experiment observations may be spread over several days.

Materials Required: Triangular prisms, grow light, black light, sheet of plexiglass, month-old bean and corn plants, black plastic.

Action:

1. Begin by growing plants in the classroom. The plants should be sprouted a month before you plan to conduct the activity.

2. Inform yourself about safety practices with black light. Use the black plastic to shroud the experiment to shield the classroom from UV light.

3. Explain that there are ways to break sunlight into different wavelengths. Ask students if they know of ways that light rays can be broken up.

4. Divide students into cooperative lab groups. Pass out a triangular prism to each group. Using the light beam from a slide or filmstrip projector, demonstrate how light can be separated into different wavelengths. If there is sufficient sunlight, have students use the prisms outside and experiment with separating white light. Explain that different colors of light in the spectrum represent different wavelengths of light on both ends of the spectrum that we are not able to see. Explain that the shorter wavelengths of light are called ultraviolet and we cannot see that light. The lengths that are longer than red are also invisible and are infrared.

Introduce ultraviolet light and show students the black light. Explain that this light gives off ultraviolet light. Exercise appropriate safety precautions when using the UV light.

Set up three plant stations. Each station should have 2-3 plants. Explain to students that they are going to test to see if different kinds of light affect how plants grow. Ask each lab group to make predictions about the experiment.

	Station 1 Time Grow Light	Station 2 Black Light	Station 3 Black Light (sheet of plexiglass between light and plants)
10 min	________	________	________
1 hour	________	________	________
Day 2	________	________	________
Day 3	________	________	________

Each group should have their own chart and then transfer results to large butcher paper.

Discuss observations. There should be an observable difference between plants grown under grow light and the black light. The plexiglass should protect the plants from the UV light.

Show students an illustration of the stratosphere depicting stratosphere, troposphere and the ozone layer. Share information with students about the role of ozone and how it protects the Earth from the ultraviolet light. Relate the plexiglass to the ozone layer.

After students have been given information about ozone layer, assess how students apply their observations about the bean plant experiments to ozone layer.

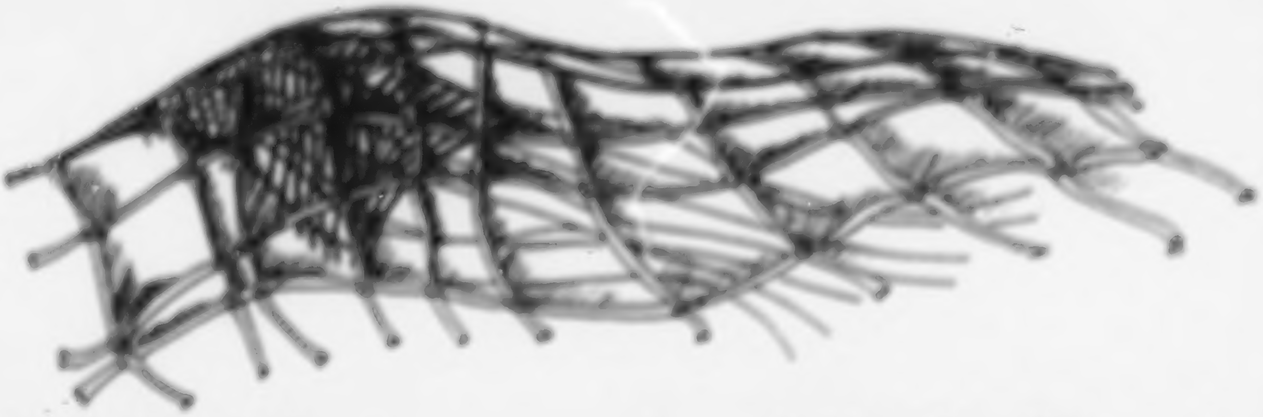
CFC Sources

The following list represents the ten largest uses of CFCs based on consumption in millions of pounds, during 1986.

Application	**Consumption (million lbs)**
1. Air Conditioning (motor vehicles)	120
2. Refrigeration (retail food)	95
3. Critical cleaning (electronics)	75
4. Open top vapor degreasing (metals, plastics)	41
5. Rigid insulation (roofing and sheeting)	55
6. Rigid insulation (pour in place foams)	44
7. Air Conditioning (centrifugal chillers)	40
8. Sterilants (medical instruments)	22
9. Foam packing (foodie clamshells)	21
10. Aerosol sprays (essential uses)	21

Source: Stone in a Glass House: CFCs and Ozone Depletion, D.G. Cogan, 1988

An international environmental concern...



Drift Nets on the High Seas

From Northwest Passages, Marine Educators Newsletter and Project WILD Aquatic Supplement

International driftnet fishery in the Pacific is causing concern to both fishermen and environmentalists. The nets, long curtains of single-strand monofilament, are set at sea by Japanese, Taiwanese and Korean fishermen in international waters of the Pacific. The nets are so effective that they result not only in overfishing of target species, but take an alarming number of seabirds, marine mammals and non-target fish. The nets have killed thousands of Dall's porpoises and seals each year. Other species killed include right whales, dolphins and sea lions. There have been 21 species of seabirds reported from driftnets of which the majority are short-tailed shearwaters and tufted puffins.

The nets are set at night and are retrieved during the day. They range from 9 miles to 30 miles in length. Some of the nets are never retrieved and miles of net are lost. These "ghost nets" continue to fish 24 hours a day and entangle everything that crosses their path. In addition to numerous animals being caught and killed by the nets, the lost nets become navigational hazards for other boats. Most fishing boats crossing the Pacific now carry scuba gear so that its crew can untangle propellers. This endangers crew members and incurs lost time and dollars.

Environmentalists fear that damage to the Pacific ecosystem is being caused by the nets. West coast fishermen are concerned when their salmon or tuna catches decrease and the fish they do catch have net marks on them.

A global ban on driftnet fishing is before the United Nations. Both Taiwan and Korea, who are involved in the fishing, are non-voting observers to the United Nations. The U.S. Coast Guard, Pacific Coast representatives and senators are aware of the problems and are looking for solutions, but international fishing always brings special problems.

Background on driftnetting

Fish supply the main source of protein for nearly half of the five billion people on the planet. Humans have been engaged in fish gathering since prehistoric times. Methods of catching fish probably started with humans wading into drying wetlands at the edges of large shallow lakes. There with bare hands and clubs, they began the first uses of fish as a human food source. Later, new technologies were invented. Rock weirs or dams were built on streams and rivers. The fish were then trapped and speared in holding ponds. Eventually, baskets were fashioned that allowed fish to swim downstream into intricately woven baffles that prevented escape.

Following the use of spears and hooks to kill fish, the net was invented. It was the net that enabled fishing to move from small scale subsistence for the family or tribe to huge economic ventures.

As changes occurred, the net evolved in size, design, and effectiveness. There are a great variety of nets now available for snatching different fish species in different situations. Gill nets, purse seines, trammel nets, and drift nets have all improved the fishers' catch rate. Yet these technologies have also introduced new problems such as impact on marine life not intended to be caught, size discrimination, over-catching, and destruction of marine habitats.

Evidence of boats and rafts being

used in fishing goes back to the stone age. The first revolution in boat design came when fishing boats shifted from dugouts to sailing vessels. The technology of sails did much to allow people fishing to extend both their range and catch. But nothing seems to have matched the revolution created by steam and later diesel-driven fishing fleets. These vessels could go rapidly to any spot in the oceanic world.

Nets combined with the range and maneuverability of steam and diesel boats made it possible to catch larger and larger amounts of smaller and smaller fish. For commercial fishers, this creates a problem when mixed species are caught. Since most have a specific fish in mind to catch, the other species that are netted are caught inadvertently. Those fishing must cull the unwanted fish from their nets or sort them later. In either case they are usually not returned to the sea.

Along with the technological changes in boats and nets, there has been a considerable change in other support fishing gear. Commercial fishers now routinely use complex sonar fish finders, radio communications, spotter aircraft, computerized navigational equipment, at-sea catch processing, and other similar sophisticated tools. Today, nearly fourteen million tons of sardines, herring, and anchovies are netted commercially each year. Approximately thirty-two million tons of other kinds of fish are caught annually. Japan, Russia, and China are the largest fishing nations of the world.

With the increasing sources of accessible fish, new markets were created. Today human consumption of fish for food is 25% of the total catch. The majority of fish are caught for fertilizer, oil, pet food, and fish meal to feed livestock. There are serious concerns about excessive fishing of some fish species.

For many fish species, the single most critical issue may be suitable habitat. Breeding grounds near shore are being lost at an alarming rate. Shoreline development, municipal and industrial waste, and offshore drilling are all contributing to the loss and the dangers. Because no one knows how many fish there are in the sea, it is difficult to know how many of the populations of species have changed.

It is clear, however, that many commercial fishers are reporting fewer and fewer fish in many traditional fishing sites. Non-commercial fishers are also reporting similar concerns in some places. Such concerns have led more countries to extend territorial limits and develop more stringent regulations for both freshwater and marine situations. Compliance and enforcement are problems for all nations. There are success stories, however. Some species seemed to have reached a balance between catch and reproduction rates. In some places, like the Great Lakes, species have been brought back into a dynamic balance after previous depletion of populations of fish by excessive unregulated fishing and pollution.

Activity

Activity: Net Gain, Net Effect

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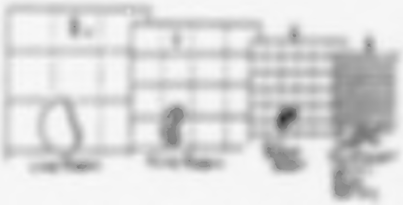
The following activity focuses especially on some changes in fishing technology that have led to today's vast commercial fishing activities.

This activity does not address ethical questions related to the appropriateness or inappropriateness of catching fish for human uses. This discussion may be added at the professional discretion of the educator conducting the activity.

The major purpose of this activity is for students to acquire some understanding of the history of fishing and the effects of modern technologies on fish populations.

Materials: Nets of differing mesh size (see table below): onion bags, potato bags, fruit bags, or netting from hardware store, plus cloth fabric for nets; a variety of dried beans and grains (one pound each of lima beans, pinto beans, black beans, lentils, rice); writing materials; four containers large and deep enough to hold 1/4 of the beans and rice.



Procedure: 1. Prepare the "ocean" by mixing all the beans and grains. Then divide the mixture equally into the four containers. These will be the four "fishing grounds."

2. Ask the students to decide what each bean will represent for the purposes of this activity. Fish

(Continued from page 11)

could be hypothetical or could represent actual fish that are common in your area. Each bean should represent a fish species. For example:

- Lima beans may become "Moonbeam fish"
- Lentils may become "Red Snapper fish"
- Pinto beans may become "Wonderline fish"

Make a chart matching the beans or grains with the fish they represent. Post the chart in front of the room or any place where it is easily visible to the students.

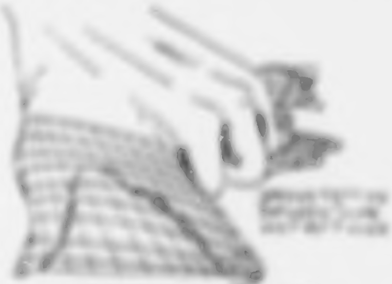
3. Divide the students up into four groups, and ask each group to go to the fishing grounds (the containers of beans and grains).

4. Discuss how fish are caught. "If you fish, how do you catch fish? Have you seen people catch fish? How were they catching their fish? Could large numbers of fish be caught if all fish were caught with rods or poles? What are some ways to catch large groups of fish at one time? (One way is with large nets as some commercial fishers do in the ocean.) What are some of the ways people used to catch fish? What are some of the ways people catch fish today?" After a general discussion of ways people fish, tell the students that they will now simulate the catching of fish using nets.

NOTE FOR TEACHERS OF OLDER STUDENTS: Have a general discussion about fishing. Who has been fishing, or seen people fishing? Has anyone ever seen people fishing commercially? What techniques did they use? Talk about how techniques for fishing have changed in some ways over time, and some have not.

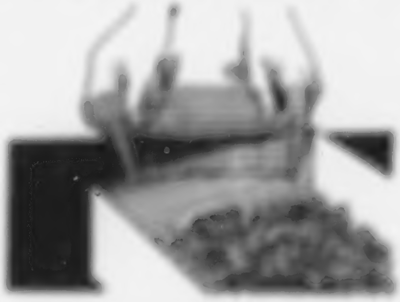
5. Next pass out the netting materials that you have. The net materials should be cut to be about four inches by six inches. The number of nets needed depends upon how many students share a net. One net for three students will work.

6. With the coarse netting in hand, ask the students to "fish." They represent people who fish commercially. They are to use only one hand. They must hold the net so that the distance between their thumb and first finger is the catching area. Ask them each to make one pass with their nets through the fishing grounds. (See the drawing below.)



NOTE FOR TEACHERS OF YOUNGER STUDENTS: Each time a "net" is used, you may want to demonstrate first for the students. When it is the students' turn, agree that they will be allowed to make only one pass into the "ocean." Show how to hold the net in your hand. Give each student a sheet of paper to represent their boat. Have them dump their "fish" into the boat. Count the number of each kind of fish caught. Record the numbers. Counting and estimating may both be used.

7. Next allow the students to use both hands. (See drawing below).



Make one pass through the "ocean." Repeat the fish count. Have the students repeat this process several times.

8. Discuss the results. Most likely, the students will have been more successful with the two hand technique. Relate this to an improvement in technology. Using both hands rather than one may represent the shift from hand powered boats and cast nets to trawlers.

9. Call the students' attention to the species they have netted. The smaller lentils and the rice often will slip through the netting and escape capture. The larger species — the limas and the pintos — are the most likely to have been caught. Ask them what they could do to catch more fish. Discuss possible options with them.

10. Next give them each a net with fine mesh (less than 1/4 inch mesh). The net itself should again measure about four inches by six inches. If they have not already done so, ask them to return all the "fish" they caught earlier to the ocean containers so that they can try fishing with the new smaller meshed net.

11. Tabulate as before and discuss the results.

12. OPTIONAL: Repeat with the nets of other size mesh, also cut to measure about four inches by six inches. Discuss.

13. Return all the fish to the ocean.

NOTE FOR TEACHERS OF YOUNGER STUDENTS: The activity may conclude with a discussion at this point. Ask the students to think and talk about what happens when the different kinds of nets are used. Is it good to let the smaller fish through the net? Why or why not? What might happen if people took all the fish from one part of the ocean? Which nets might be better to use in order to conserve the fish in our oceans? Why or why not?

OPTIONAL: Work with the students to construct a bar graph to show them the numbers of fish they caught using the different nets, and different techniques of netting.

14. Now announce a different perspective. Tell them that all the fish, beans through rice, are of the same species. Tell them that no fish can be caught that is smaller than the black bean species size. Any smaller fish that they catch will cost them a point. Tell them that a regulatory agency responsible for monitoring fishing practices will give them ten seconds to get rid of all undersized fish after each netting. Appoint two members of each fishing team to this regulatory agency.

15. Have the commercial fishers again use the fine mesh net (less than 1/4 inch mesh) and make a catch.

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They have to empty the net onto the table and one by one return the undersized fish to the ocean. At the end of ten seconds, they must stop and the representatives of the regulatory agency will count the undersized fish that are still left and fine them one point for each one.

16. OPTIONAL: Discuss the economics involved. Can the people fishing afford to return all the undersized fish to the sea? What are their options? Should we release undersized fish? If yes, why? If no, why not?

17. Repeat with one of the larger mesh nets. Is there an advantage to letting the smaller fish get through the net over returning them by hand? Discuss how dolphins and sea turtles are often caught in nets. Point out how for the dolphins and sea turtles the problem is reversed. They are too large to escape.

NOTE: Efforts are being made to design, use, and enforce the use of nets and other fishing equipment that will reduce the loss of dolphins and sea turtles under these conditions.

18. Ask the students to summarize what they have learned. Review the general history of fishing, including how each new technological change may have affected fish populations. Consider possible impacts on fish habitats as well. Identify some of the potential tradeoffs related to changes in fishing technologies. Conclude with a discussion of how, if at all, the students think fishing technologies can be developed that minimize any potential long term negative consequences to healthy fish populations and aquatic environments.

FOR MORE RESOURCES AND INFORMATION ON THIS SUBJECT, CONTACT THE FOLLOWING:

Center for Marine Conservation [illegible]
Hatfield Marine Station [illegible]
[illegible] Marine Science Center [illegible]
[illegible] Marine Science Center [illegible]

Groundrules for the 3 E's

by Neal Maine

Controversy often fuels the process by which people separate certain conceptual terms. We begin to ascribe signs or symbols to represent different ideas or concepts. However, these descriptions often lose their original meaning, and take on a different interpretation than what is functionally defined. [illegible] ecological systems operate in the absence of these mental constructs. Culture is constantly seeking other forms of concepts to express complex systems. The following are working concepts that may be helpful in improving the quality of the communication in the public forum.

The following terms are constantly used as though they are interchangeable, but this is not the case. This lack of clarity has led to major confusion among the lay public and some professionals. For these reasons the following may be helpful.

ECOSYSTEMS: are the sum of all of the biological, chemical and physical interactions that occur on our globe. These systems, as defined by humans, can scale to many sizes, but their boundaries are more or less nebulous. The sum of these overlapping systems is the larger "earth ecosystem," within which the infinite number of smaller unique ecosystems constantly interact, thus affecting the whole. These interactions are value free, that is to say there are no "good or bad" interactions, only reactions or responses to the events within these ecosystems governed by the physical and chemical limits by which living organisms are bound.

ECOLOGY: is a "human" endeavor which attempts to discover and articulate the laws and processes of ecosystems. As with the other sciences, ecology is the sum of the agreed upon methods by which science attempts to "know" about these events unfolding within the ecosystems and study and to record and communicate those understandings. This process attempts to be value free, and is dedicated to the holistic understanding of as many biological processes as possible.

ENVIRONMENTALISM: is the thoughtful consideration of the events described by ecology within the context of human interaction and value systems. The need to consider the "facts" or opinions generated by ecology [illegible] economics, [illegible] where we find ourselves today. This brings about the cultural exchange that is so important to us all as we [illegible] observe the subtle balance in the ecosystem and insist that our human actions [illegible] occur. Even though anything we do will be "ecologically sound," certain behaviors [illegible] ecology may be more appropriate to achieve a particular set of goals. If those goals presented within an ecological framework often conflicted with apparent economic needs, then only the "environmentalist" opinion [illegible]

Reference: [illegible] Marine Ecology, by Richard Murphy, [illegible] Institute for Marine and Coastal Studies, Sea Grant Program, University of Southern California, University Park, Los Angeles, California, 1979.

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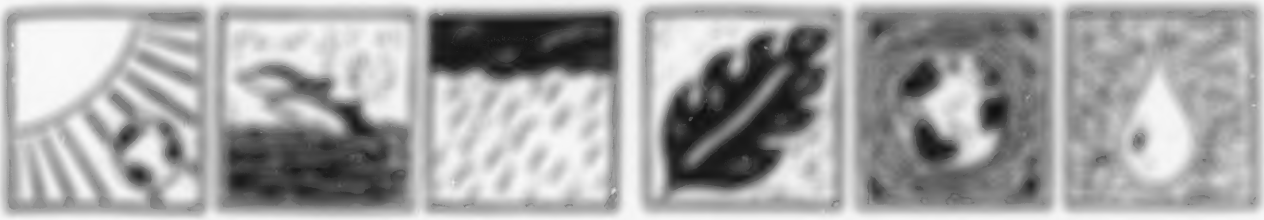
CLEARING

environmental education in the pacific northwest

A Global Overview:

Trends in Environment and Development



by Mary E. Paden
World Resources Institute
Washington, D.C.

[illegible]

The Air and the Sky

[illegible]

Climate Change

[illegible]

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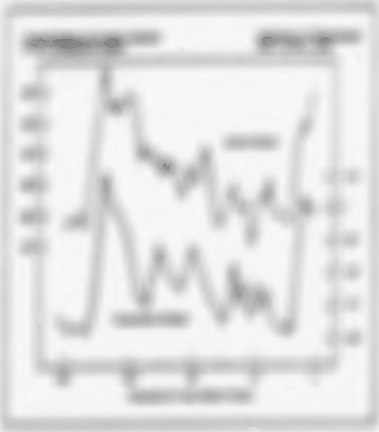

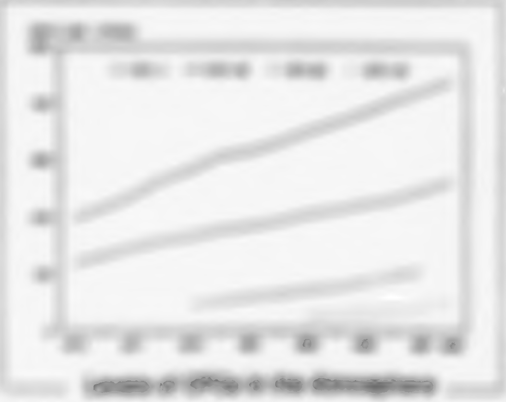

Levels of CFCs in the Atmosphere

The Creatures and the Land

Biological Diversity

[illegible]

Air Pollution

[illegible]

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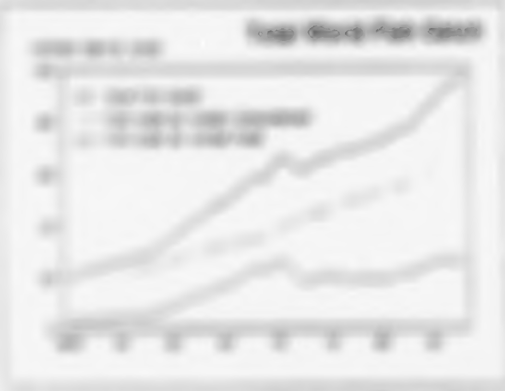

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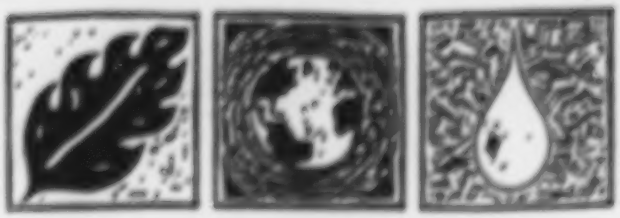
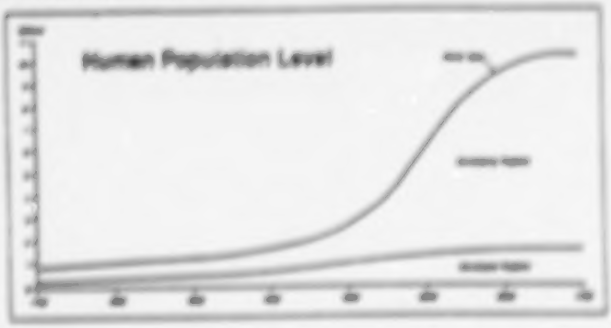


affected by both pollution and by overfishing. In four areas — the Mediterranean, the Northwest Pacific, the Southeast Pacific, and the eastern Indian Ocean — catches in recent years have exceeded the sustainable limit.

Because fish populations naturally fluctuate, it is difficult to determine when pollution or overfishing are causing a population decline. Thus it is had to restrict fishing — putting people out of work — when you can't prove long term decline is beginning. Yet without restrictions we are sure to exceed the sustainable limits of the sea and the fish may not be able to bounce back.



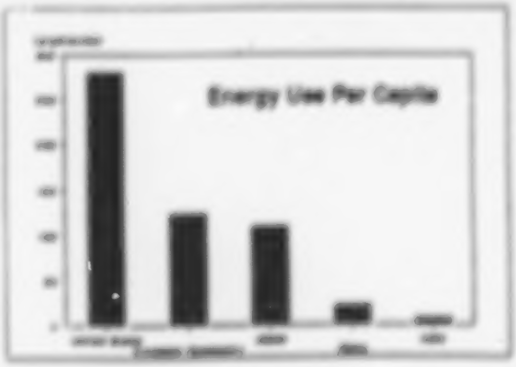
Several times in the past technological advances in fishing gear have caused rapid depletion of fish stocks. The most recent technological advance is the driftnet. Up to 35 miles long and 30 miles deep, these nets are set adrift all night and they virtually strip mine the seas of all life — whales, dolphins, and turtles as well as fish. They are used in the Pacific and in the Mediterranean.

Some Connections

Just to recognize the interconnectedness of things, let's look at the effects on the ocean of some of the problems mentioned above. Global warming would warm ocean water and cause it to expand, thus raising the sea level. It could also melt some polar ice, further raising sea levels. Coastal flooding would not only be difficult for shoreline property owners, it would also drown marshes and mangrove areas where many fish breed. Warmer water might also kill coral reefs, which live near the top of their temperature tolerance. Lack of ozone protection may allow ultraviolet rays to kill tiny plankton in the surface of ocean water. These plankton are the base of the aquatic food web. Air pollution can actually affect fish — waters of the Chesapeake Bay receive much of their acid input from air pollution.

The ocean has fewer endemic species than the land, however the most biologically diverse marine life tends to be found in some of the most vulnerable habitats: coral reefs, mangrove areas, and coastal wetlands. These areas are often damaged by fishing techniques, pollution, and coastal development.

Deforestation leads to soil erosion, which clogs streams, rivers, and coastal areas with sediment. Suspended sediments kill submerged aquatic plants, which serve as food for many organisms, by blocking their sunlight. And sediment smothers shellfish beds and reefs.

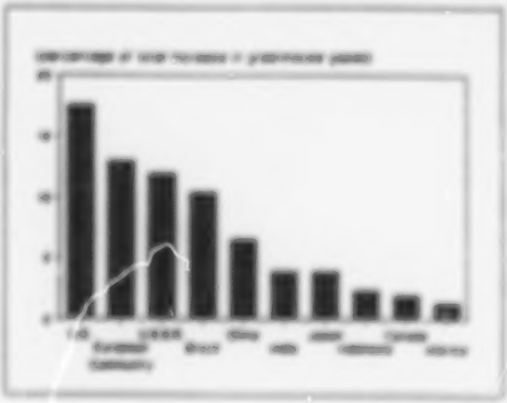


People and Poverty

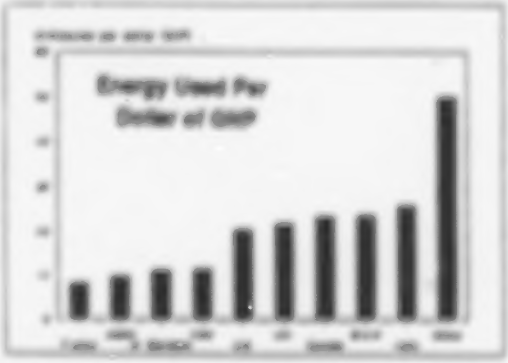
The growth curve of the human population is the steepest of any of the trend lines we have to show. Most of this growth is in developing countries. The growth in most developed countries has stabilized. Obviously, large numbers of people can affect the environment by using up resources and by polluting. When looking at people/environment interactions, it is necessary to look at just how much resources are used or pollution created per capita in different regions. Note that while India has a much larger population than the U.S., its use of energy is so much lower that it has an overall lower energy use. As India develops it will use more energy per capita. This is one of the basic issues in environmental discussions with developing countries. Developing countries naturally want to develop — to have a better life — like they see us having. Some environmentalists see a conflict between environment and development in the United States and in the developing world — as if you could only have one or the other. However, most environmentalists who work in the developing world see that these countries must develop to meet the needs of their people. The question is: Can they take a path to development that is less consumptive and polluting than the path we took? How are developing countries developing? The Newly Industrialized countries have created a middle class and a better life for most of their citizens. On the other hand, many countries are either holding steady or actually sliding backwards in providing urban services, jobs, safety, and environmental protection for their citizens. More than 1 billion people in developing countries live in absolute poverty. Although the percentage of the population in absolute poverty shrank between 1970 and 1985, the total number of people in poverty increased by one fifth because of the growing population. About three quarters of these poor are clustered in environmentally fragile areas with low agricultural potential. Environmental degradation and poverty reinforce each other. Many of the poor live in shantytowns built around large cities.

Most cities have been unable to keep up with their population growth in terms of providing services. For example, sanitation service — a basic health and environmental service — reaches a smaller percentage of the population than it did 10 years ago, despite the installation of more services, because the population grew faster than the sewers were built.

Gross National Product per capita has declined in many developing countries over the past 10 years. The cause is generally recognized as a combination of the falling prices for raw materials and agriculture commodities (the major exports of most developing countries), large payments on debts to private and multilateral banks, and in some cases, poor management or government corruption.



So most developing countries are having a hard time right now. If they don't develop, they will find more and more citizens living in poverty, degrading marginal farmland, cutting forests, polluting waterways. On the other hand, if they do develop as we did they would place heavy demands on nonrenewable resources such as oil, and cause major atmospheric pollution.



Hopeful Indicators

There are two indicators that point to a way out of this dilemma. These indicators counter two myths about environmental and development. The first myth is that a country must get rich in order to provide its citizens with a good life, or conversely that people in poorer countries are doomed to substandard conditions. One indicator — the Human Development Index (HDI) developed by the United Nations Development Programme — shows basically that you don't need a lot of money to live a good life. The HDI attempts to measure the well being of a country's citizens in terms of health, education, and economics. When countries ranked by GNP and HDI are plotted on the same graph, it is clear that there is no automatic link between the level of per capita income in a country and the level of its human development.

A country with a low GNP can have a much higher HDI if it has government policies that foster education, health, and income distribution.

The second myth is that a country must use a lot more energy in order to develop. The second indicator, the Energy Intensity Index, shows that you don't need a lot of energy to be a highly developed country. This index measures kilojoules of commercial energy used per dollar of GNP. As you can see), France and Japan — both highly developed countries — are under 10,000. The United States is double that — just above 20,000. Thus we use twice as much energy as France and Japan to produce a single dollar of GNP. Now look at some major developing countries: India, 28,000; China, 43,000; Venezuela, 30,000; Egypt, 34,000. All are higher than even the United States. Clearly there is room for energy conservation technology in these countries. It's also interesting to look at the trends in energy intensities. Energy intensity for all developed countries went down as oil prices went up. In other worlds, when energy got expensive, countries figured out how to produce the same dollar of GNP with less energy use. It seems possible that developing countries could do the same.

You can easily see that much of the future of the world's environment lies in the hands of developing countries. And I hope you can see that environmental quality must go hand in hand with development. The future of the rainforests, of many species, of the productivity of the land itself depends on people finding new paths of development — sustainable development that produces rewards in the present without draining the resources upon which it is based. The challenge to us as environmentalists, educators, and researchers is to present a clear picture of global environmental issues to our colleagues and students, to work with developing countries when possible, and to work toward U.S. policies that promote sustainable development, both here and abroad.

This paper is taken from the presentation of the 1990 conference of the North American Association for Environmental Education in San Antonio, Texas.

Environmental Education, Problem Solving, and Some Humility Please

Action and problem solving are two concepts, frequently linked, which are central to many goal statements for environmental education. However it is often not clear what is meant by these terms and the extent to which they are educationally justifiable. This paper examines some misconceptions about the roles of action and problem solving in environmental education.

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A significant challenge for environmental educators in the 1990s will be to seriously re-examine their goals. Environmental concern has recently become an important part of the public agenda and we can expect increased interest in education to follow. However, if we are to continue having an impact, we must be sure that what we do is logically coherent and educationally sound.

Environmental education has definition and structure, and presumably questions about goals should have been laid to rest years ago (Hungerford, Peyton & Wilke, 1980). While environmental education may have been defined, it is less certain that these definitions are appropriate. Such assertions arise either out of a misunderstanding of the nature of educational discourse, or as Robottom (1987) describes, from "an attempt to control the language of environmental education." In this paper, I assess the concept of "problem solving," and argue that use of this term exaggerates the abilities of environmental educators and students. I conclude that self-confidence must be tempered with humility: we must be more modest in our claims.

Recently Schoenfeld (1989) report that the birth of environmental education coincided with a rise in public awareness about such problems as pollution, pesticides, population, and people's habits and this field of study mirrored concern for those "problems." The importance given to their solution was reflected in objectives for environmental education identified by Bill Stapp. Among others, he suggested we help individuals acquire:

> *A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and government to work toward their solution.* (1969, p. 31)

Since then, there have been other expressions of the same or similar aims (UNESCO-UNEP, 1976; Ramsey, Hungerford & Tomera, 1981; Hungerford and Volk, 1990; NAEE Mission Statement). Most recently I find that:

> *We are no longer debating whether real-life problem solving and action have places in our goals, curriculum materials, and school programs.* (Marcinkowski, 1989-90)

Consider the implications of establishing problem solving as a goal of environmental education. Such talk implies first, that there is a solution, and second, that students are expected to find it. Inability to do so would constitute failure on the part of learners to succeed at a prescribed aim for the activity in which they are engaged. While it makes sense to talk about problem solving in mathematics, I do not believe that the same can be said for environmental education. For example, an algebraic question requires the manipulation of a number of known factors so that the value of an unknown variable can be determined; the answer to such questions are, characteristically, precise and these problems have discrete or solvable solutions. In fact, it appears more likely that environmental educators have misappropriated a term which finds its natural home in mathematics. Problem solving denotes a level of precision, exactness and plausibility alien to the careful investigation of environmental issues. Expecting children to solve environmental problems without proper regard for their infinite complexities, is setting them up for potential failure. One can speculate how the resulting failure could be devastating for kids. To continue to urge action which is unattainable and futile is a disservice to persons and serious thought about these issues (Kennedy, 1985). Perhaps we are not sufficiently humble about our understanding of complex environmental phenomena and the limitations of our mission. The possible failure, either immediate or masked by a false sense of accomplishment, will be discussed further. First, however, it is important to consider inherent characteristics of the word "problem."

Australian philosopher John Passmore put the distinction succinctly: "an ecological problem is not, in the first place, the same thing as a problem of ecology" (1974). By this he means that a problem in ecology is a scientific problem arising out of the fact that scientists do not understand a particular phenomenon. Having identified a gap in their knowledge, they can then employ their various techniques in an attempt to solve the puzzle. On the other hand, an ecological problem (Passmore uses "ecological" here in a way that would be interchangeable with "environmental") is in fact a type of social problem. It is deemed a problem, not because of a gap in knowledge, or our failure to understand a phenomenon, but because the environmental problem describes a phenomenon which we do not like and have judged socially unacceptable. Problems of this kind are not resolved. Rather, they cease to exist when steps are taken to reduce the irritation to socially acceptable levels of tolerance.

While investigation of issues is important, we must be more humble in our aspiration; we must curtail our zeal to solve environmental problems.

I think most would agree that it would be impractical, if not impossible, to totally eliminate pollution; production of waste is a condition of our survival. Though this kind of problem may appear to go away under certain circumstances, it is not ultimately solvable.

Some might argue that one can work to reduce pollution to particular levels or standards. This, however, may be no solution at all. First, consider the arbitrary nature of the standards; there are not absolute values of acceptable pollution. Standards require constant re-evaluation in light of new evidence and argument as various interests advance competing claims. To simply aspire to reduce pollution to some such standard of acceptability would, at best, constitute a partial solution and, at worst, a pseudo-solution. Satisfaction with such results would beg important questions about the appropriateness of the compromises inevitably involved in establishing standards. It should be clear that at the heart of the issue are questions about what is, or should be, socially acceptable. Critical reflection about those values which determine social acceptability is essential to clear thinking about an issue. Perpetuating the "problem solving" myth is antithetical to the notion of such clear thinking. Ethical positions are not static and do not provide concrete solutions; they are constantly being re-examined, re-evaluated and re-defined. Surely this sort of activity is more consistent with the educational enterprise. Unfortunately, concentrating on problem resolution often distracts from these more fundamental issues. Because the ultimate issues are not resolvable in a way which is satisfactory to the scientific mind, pseudo-problems are created.

Pseudo-problems, or problems which are defined without regard to basic questions, allow people to address immediate concerns though underlying difficulties are overlooked or ignored. In reality, programs are often simply managing the symptoms of a much more complex and difficult issue. This tinkering with symptoms can be likened to applying patches to leaky boats. Immediate treatment of symptoms can be very important, but the idea that this constitutes problem solving overstates the nature of the accomplishment. As such, it tends to be self-congratulatory, intellectually dishonest and dangerous.

Another concern is about the development of problem solving skills. What is at issue here is the use of the word "skill." Others have argued extensively about the inappropriateness of trying to reduce complex intellectual activities to a set of skills. I will not attempt to recreate their arguments here. However, given the previous discussion, environmental problem solving, or more correctly issue investigation, is a complex intellectual activity. Therefore, talk about a discrete set of environmental problem solving skills is facile. Attempts to reduce the study of environmental issues to problem solving exercises and talk of problem solving skills appear to be symptomatic of a much larger problem in the education community. Through attempts to simplify difficult matters for the easy consumption of unwilling clients, we often trivialize them.

Having been critical of one of the institutions of environmental education I confess I have no alternative blueprint. However, I do see directions for inquiry which need more attention. First, our task as educators is not to train students to necessarily solve environmental problems; it is to educate. This is inextricably linked to acquisition of knowledge and understanding, clear and critical thinking and care about the use of reason.

Education will not only help students to understand science, but also the limits of this discipline. We must resist inappropriate attempts to cast complex social issues into the language and methodologies of science. Science will not solve many so-called environmental problems. Fundamental to these issues are questions about who we are, our attitudes to non-human components of the environment and what principles will enable us to build a better society. Having argued about our principles, there will be questions about how those should be logically interpreted and implemented in specific instances. It follows that we must prepare students to participate in ethical debate and, heaven forbid, metaphysical discussion. This does not mean that we should abandon the investigation of environmental issues. These preparations can only take place in some context, with content and issues to examine. Critical and intelligent pursuit of current issues should be central to an educator's efforts and will justifiably occupy an important place in environmental education.

While investigation of issues is important, we must be more humble in our aspirations; we must curtail our zeal to solve environmental problems. We must pursue our investigations with passion and encourage passion in our students. But, let us be passionate about pursuit of truth, rightness and humility. Indeed, let us work with humility, that sense of being small, even diminutive, in a large complex world. Humility does not mean passivity. We must allow students to think about things which are important to them. They must be able to participate in issue investigation and persuaded to act, if they wish, on the best available evidence and argument. However, intellectual integrity dictates that they, too, pursue actions with humility: students will not be solving problems. They will simply be participating as intelligent individuals in the creation or maintenance and re-casting of society.

As academics we must be more humble and introspective. Let us invite discussion, debate and criticism about our foundations and principles. Any suggestion that practitioners accept definitions uncritically is both insulting and arrogant. It is ironic that as educators we attempt to engage students in critical reflection, yet we find an article in an influential international journal which discourages critical scrutiny in environmental education. To oppose discussion about aims and aspirations can only be described as anti-intellectual.

Sand Maps

Goal
To gain a better understanding of geography and the physical interactions of erosion.

Ages
3rd grade to adult

Concepts
Interaction, change, cycle

Objectives
1) Students will be able to construct a scale relief map of their state or province in the sand.
2) Students will be able to predict areas of their map most prone to erosion.
3) Students will hypothesize how selected major features of their region were formed and have changed.

Time
45-60 minutes

Materials
Some digging tools, maps of their state or province (preferably relief maps), garden can sprinklers, magnetic compasses

Procedure
1) Divide the students into groups; have each group determine north and true north. Have students orient their maps towards north.
2) Give each group an information card with 8-10 geographic features to build into their maps. Allow plenty of time for the creation of the maps.
3) Have groups label prominent features of the map. Check each group as construction continues to ensure success.
4) Appoint a spokesperson from each group to share their final product with the other groups. Ask students to predict what effect erosion from water would have on their maps. After each presentation, pour water from the sprinkler cans on the maps. Have students describe the results.
5) Have students discuss what ways people change the land to reduce erosion or to aid erosion.

Note: This activity is excellent as an introductory lesson when first arriving at the coast with a classroom. It allows students to dig in the sand while learning some basic geology/oceanography.

Having taught many school groups at the coast in marine studies, it was somewhat disappointing when I first did this activity and realized that most students did not know where they were. I felt as if I short-changed the previous groups: how can a student gain concept awareness without knowing where they are? Geography, it used to be the lost science. I have found this true with most students.

Kay Willis, Oregon Museum of Science and Industry

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Dwindling Northwest Salmon

Hydroelectric dams and other uses of the Columbia River have imperiled the wild salmon that once flourished in the Pacific Northwest. But listing several species as threatened or endangered could cause major disruptions of life and commerce along the river. Teachers can help students understand the vital importance of the river, and the many ways we depend upon its health.

We're Salmon People and that is part of our life -- the whole salmon. We're built into our life and if he's gone, we'll all be gone. That's the way we teach our children, so they have respect for that salmon or that eagle, or these birds or the animals. They have respect for them. And my dad said the land is [illegible] years old that we're here for a short time; you and I won't be here, but our children will be here, so keep teaching your children the Indian way. And living the Indian way is very hard now, in this century.

Who are you? I am an Indian. I live on the Nisqually River. There's my canoe, and this is my watershed. I live here. I fish here. I hunt here. I do what I do. I teach my children.

We were close to Nature. We were close to everything: the air. We were close to the sun, to the moon. We're hurt. We're hurt by some of the things that I see that have taken place throughout the Northwest, in our beautiful Northwest, and how people have not respected Nature in doing things. I see it being black-topped and cemented. I see our rainforests being taken away. I see our creeks being blocked, and I see our salmon disappearing. But you still teach your children to carry on and care for Nature. And what that does for all of us is a quality of life."

Billy Frank, Northwest Indian Fisheries Commission

Idaho's Salmon River has lost its namesake. Ironically enough, it has become a river to which even salmon no longer come back.

Journals kept by miners in the 19th century told of nearby creeks and lakes teeming with sockeye and Chinook salmon that swam 900 miles from the Pacific Ocean up the Columbia, Snake and Salmon rivers to their spawning grounds. Fishermen caught them by the thousands and sold them to mining camps.

But as the 21st century draws near, the sockeye is nearly extinct and other species have dwindled to the point that conservation groups want them declared endangered.

That prospect alarms public officials already reeling from a decision to list the northern spotted owl as a threatened species. The new protected status for the bird will severely affect logging, one of the Pacific Northwest's largest industries.

The stakes are much higher in the salmon debate. The future of salmon could very well determine the future of the Columbia River, a source for most of the power generated in the Pacific Northwest and a major transportation artery for the region. "I think we could see a tremendous downturn in the production of electricity and economic devastation of a greater magnitude than caused by the spotted owl," says Senator Bob Packwood, R-Ore.

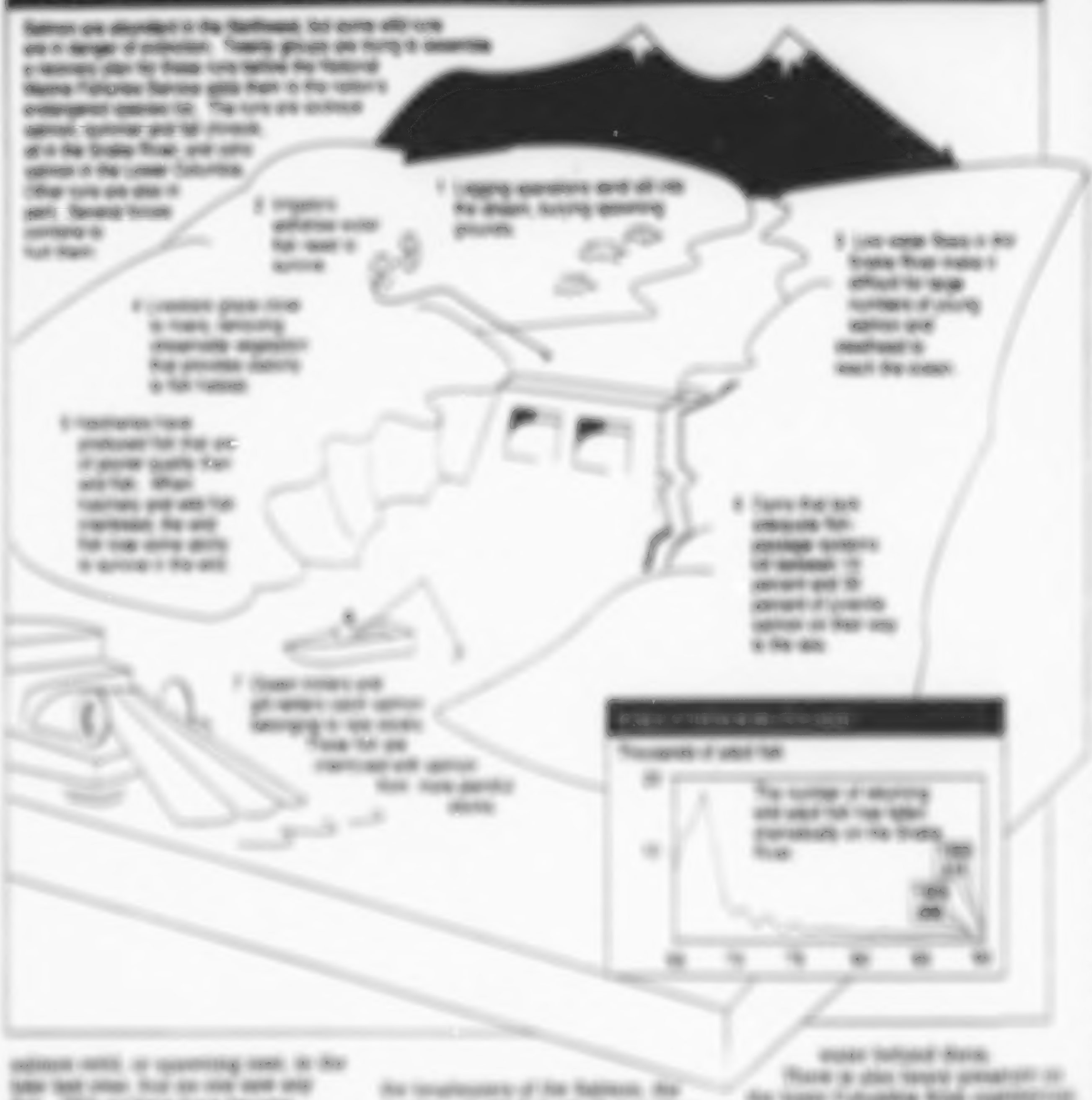
"Listing a salmon species as threatened or endangered could affect everyone who uses the Columbia River," adds James Jura, head of the Bonneville Power Administration, the federal agency that runs a series of hydroelectric dams in the Northwest.

Proposals for saving the salmon have ranged from temporarily curtailing all fishing to blowing up some of the major dams on the Columbia and Snake rivers.

Only two adult sockeye were observed climbing over the Lower Granite Dam on the Snake River this year, said [illegible], a biologist for the state of Idaho. Fewer than 75 sockeye have been observed climbing over the fish ladder at the dam in each of the past five years. The Lower Granite Dam is about [illegible] miles downstream from Red Fish Lake.

Scientists found evidence of one

WILD SALMON IN DANGER



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WILD SALMON IN DANGER

The Columbia River Basin: dams vs. salmon

[illegible]

Salmon Teaching Resources

[illegible]

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Converting "It's No Use" Into "Hey, There's a Lot I Can Do": A Matrix for Environmental Action Taking

[illegible]

Earth as Mentor:

Examples from Native North America

by [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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PTA Group Develops Collins School Wetlands in Tacoma

[illegible]

[illegible]

Exemplary EE Programs

[illegible]

Environmental Education

in the Pacific Northwest

[illegible]

Wetlands in the Curriculum of North Mason School District

[illegible]

[illegible]

Exemplary EE Programs

[illegible]

to the wetlands monthly for plant and ecological studies. A team of high school students is performing water quality tests and macroinvertebrate bioassessment on the fresh water areas in and leading into the site.

These are exciting times at North Mason. We look forward implementing our new focus of teaching with the goal of developing students with a real appreciation not only of their own beautiful environment, but also the rest of the world.

Many of our teachers are trained in wetlands and environmental teaching, and our students are becoming experts, too. We invite you to visit. We welcome visitors to our libraries and, we have many teachers and students who would love to share our outdoor classroom. If interested, contact Karen Lippy at (206) 275-6333 or 275-2611.

WATER TESTING ACTIVITY

Want to get your students involved in "real research"? All it takes is a stream or pond, some inexpensive water testing kits, and a bucket and handkerchief or net.

Simple water quality test kits, such as those available from LaMotte Chemical, can be used to check the major water quality parameters. The kits are easy to use and have good directions.

Bioassessment involves the examination of the types of macroinvertebrates (bugs), that are found in water. The type of bugs found are very good indicators of the water's quality for that growing season. The bugs are simply brushed off of rocks into a bucket of water and strained through a handkerchief or net.

These activities are simple to learn and do, can involve lots of students in hands-on research, and collects information that really brings home the issue of water quality to students. You may also find a use for the data in your local community.

Resources that will help you get started:

LaMotte Chemical Products Company
P.O. Box 329
Chestertown, Maryland 21620
(301) 778-3100

Water Quality Indicators Guide: Surface Waters
United States Department of Agriculture
Publication number SCS-TP-161

The Stream Scene: Watersheds, Wildlife, and People
curriculum and accompanying video on Macroinvertebrate Sampling
Oregon Department of Fish and Wildlife
P.O. Box 59
Portland, Oregon 97207

and finally, me:
Karen Lippy
P.O. Box 167
Belfair, Washington 98528
(206) 275-2611

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CLEARING

environmental education in the pacific northwest

Dancing On The Brink of the World

The Ohlone people, people living simply in nature, rich in myth, on the shores of San Francisco Bay and Monterey Bay in what is now California, were "discovered" by the Spanish in the 1770's. Within fifty years of this discovery, the Ohlone were almost gone -- dead of European diseases, murdered and raped by white men, deprived of their best hunting and fishing areas. We know little of the richness of their myths, rituals, and lifestyles, but one haunting line is enough to call us, in the present generation, into awareness: "Dancing on the brink of the world."

The line may refer to dancing on the edge of the continent with the great western ocean, the western spirit gate to many Indian peoples, stretching seaward from their dancing grounds. It may refer to a particularly painful premonition that some commentators say overwhelmed them after contact with Europeans. It may refer to the dance of living beings in that land between existence and being.

It may mean all that and more. For us, living under the shadow of nuclear holocaust and the relentless conversion of Nature into commodities and managed tree farms, it has an evocative calling, a feeling.

We are dancing on the brink of our little world of which we know so little: we are dancing the dance of life of death; dancing the dream up in celebration of dimly remembered connections with our ancestors; dancing to keep the cold and darkness of a nuclear winter from chilling our bones; dancing on the brink of ecological awareness; dancing for the sake of dancing without analyzing and rationalizing and articulating without consciously probing for meaning but allowing meaning to being to emerge into our living space.

Dancing has always been part of living for primal peoples. For us, the dance may be a Ghost Dance for all that is lost: condor, bison, redwood, [illegible], wolf, whale, and passenger pigeon. Or it may be the dance of a new revelation of Being, of [illegible] and Earth wisdom on the turning point.

from **Deep Ecology: Living as if Nature Mattered**, by Bill Devall and George Sessions, published by Gibbs M. Smith, Inc. 1985.

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Garbage is No Picnic

A Play Written for Young Audiences About Recycling and Environmental Quality

by [illegible]

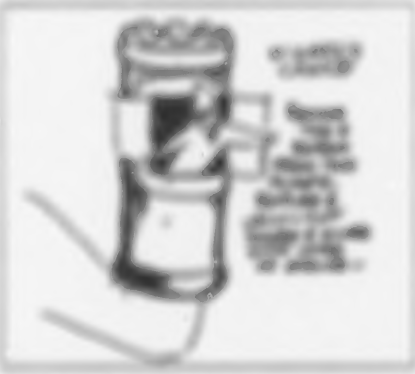
©1991 Environmental Education Project

Characters: Young Forest Dragon
Man Selling PROGRESS
Wizard
Narrator

Setting: *Dragon's cave in the Redwoods*

Puppeteer's Notes: This is presented by two puppeteers hereafter known as One and Two. (They may be dressed as traveling minstrels or court jesters or when rushed, as just somebody's landlord.)

One: Plays the part of the Dragon. She stands to stage left of the playing area (see



drawing) and operates the puppet with her right hand, resting her elbow on the playing area in a comfortable position, allowing for the Dragon to move freely inside the cave as well as with his head through the front opening. She uses her left hand to help the Dragon with his various activities.

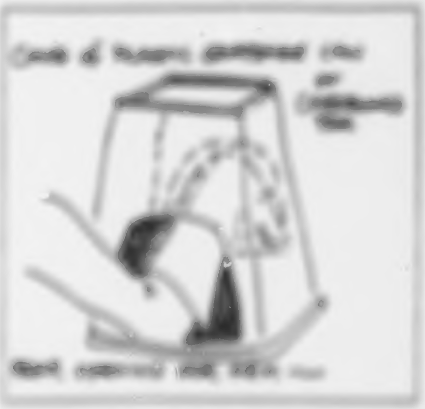
Two: Plays the part first of the Man, then as the Wizard. She is also the narrator. As the play begins, she is wearing a shoulder bag over her right shoulder. The Man is on her right hand and in the bag. When the Man runs away, he slips back into the bag, the puppeteer turns her back to the audience, removes the bag, slips the recycle bag around her neck, and the Wizard in his castle onto her left hand, then returns to the audience ready to continue.

Narrator: Once upon a time, there was a young forest dragon. He lived alone in a cave in the Redwoods. He liked to have picnics in his cave. He would take a basket and fill it with berries and lovely Dragon-fire roasted mushrooms... and for dessert he would have honey spread thick on home Dragon-baked bread that his mother would send him. Then he would wash down with a bucket of fresh mountain stream water. He was very happy and he would sing.

Dragon: *(sings a few bars of some happy tune.)*

Narrator: Then one day a man came to the forest selling PROGRESS.

Man: *(Emerges now from the bag and approaches the cave. His suitcase of goodies is already on top of the stage right area, closed. As he talks he flips open the suitcase lid and parades out each of the articles to demonstrate them.)* Young Dragon, why do you bother with that basket? Allow me to sell you a package of brown paper lunch bags. So easy to fill. Open a bag and when you are done with your lunch you can simply throw them away. And... for your berries and lovely bread, allow me to sell you some marvelous plastic bags. Aren't they splendid. They will keep your goodies fresh until you are ready to eat them and then you can throw them away. *(At first he demonstrates the throwing away, but as the Dragon catches on to this "fun" game, he takes the things in his mouth and tosses them on the floor below.)* And paper napkins are another development you cannot live without. *(Wipes the Dragon's mouth. The dragon playfully tries to eat it. The Man pretends as he throws it away.)* But, best of all, Dragon, I can sell you a drink in a bottle, or if you prefer, a can. *(The Dragon drinks from one of each.)* You won't have to go to the stream and fetch water in that ugly old bucket of yours. And... when you are done *(Dragon says it with him this time)* you can simply throw it away.



Dragon: My goodness! How wonderful that all sounds. I'll take some of each.

Narrator: *(As he talks the man begins to empty his stock, piece by piece into the Dragon's cave. He starts out slowly. The Dragon takes each piece in his mouth and after using it drops it to the bottom of his cave.)* So day after day the Dragon puts his picnic things into plastic bags, puts the whole lunch into a brown paper bag, wiped his mouth with a paper napkin, and had his drinks from a bottle or a can. *(The action speeds up a bit so that some garbage can accumulate and can be seen piling up in the cave. The Dragon pantomimes the following scene as the narrator speaks. The man is resting by his suitcase during this scene.)* First he started out with a nice orderly garbage can, but soon it began to overflow. So he decided to try burning it. *(Smoke can be made by carefully squeezing a plastic talc bottle low down in the cave.)* My goodness, that is no solution at all. The paper smoke smelled? filled his cave and burned his eyes. The plastic bags gave off a terrible smell which made him a little sick to his stomach. And the cans and bottles wouldn't burn at all. So he tried to cover it *(use the gingham napkin from the picnic basket or sit on it, or something)*. But nothing seemed to work. Every day the pile grew higher *(at this point the Man goes back to work. He piles merchandise steadily. Now he is merely piling the things of the Dragon until he is hidden under the pile.)* and higher and higher. Then one day when the Man came to deliver his napkins and bottles and bags, the Dragon was nowhere to be seen. The Man called out...

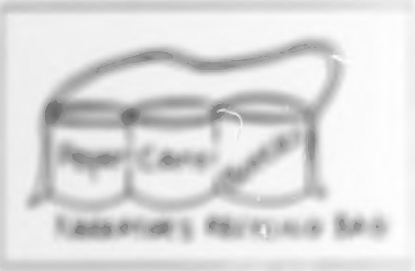
Man: Dragon! *(He looks around.)* Dragon! *(He looks in the cave.)* Dragon! *(He turns to the audience and asks them:)* Have any of you seen that Dragon?

Narrator: And from deep in the cave... from under the rubble, came the weak little voice of the Dragon.

Dragon: Help! Help! Help!

Narrator: The Man became frightened and ran away. *(He flips his suitcase around, then he dives head first into the shoulder bag from whence he came.)*

Dragon: Help! *(He continues to call periodically until the Wizard came to his aid. Meanwhile... The narrator is doing the above described switch —*



(see puppeteers notes for it). During the switch, the Wizard can begin to answer.)

Wizard: I'm coming! Don't give up hope! I'm coming. *(He is now turned around again to audience.)* Poor Dragon, you surely have yourself in a pile of trouble. Don't you know about recycling?

Dragon: *(Pushes his way up through the garbage. He emerges [illegible] and [illegible] for air.)* What's recycling?

Wizard: Ah, my friend, that's when you return things such as those cans and bottles to the manufacturers. He processes them and makes them into new things. That way the same materials can be used over and over again. Even those plastic bags, even though they don't decompose, they can be recycled.

Dragon: Hmmm, what's decompose?

Wizard: Decomposition is a kind of recycling too. Some things, such as paper, when returned to the earth, are changed into new materials. They become nourishing foods for plants (fertilizers) and help new things to grow. But not plastics. They stay around just as they are forever and ever, just piling up higher and higher like your garbage.

Dragon: Wow! I never knew that!

Wizard: And speaking of paper, Dragon, do you know where all those napkins and paper bags come from?

Dragon: *(Shakes his head no.)*

Wizard: They're made from trees.

Dragon: Really?

Wizard: Can you imagine how many trees it would take every year to make so many paper bags and napkins?

Dragon: My goodness! *(He slips back into the pile.)* Help!

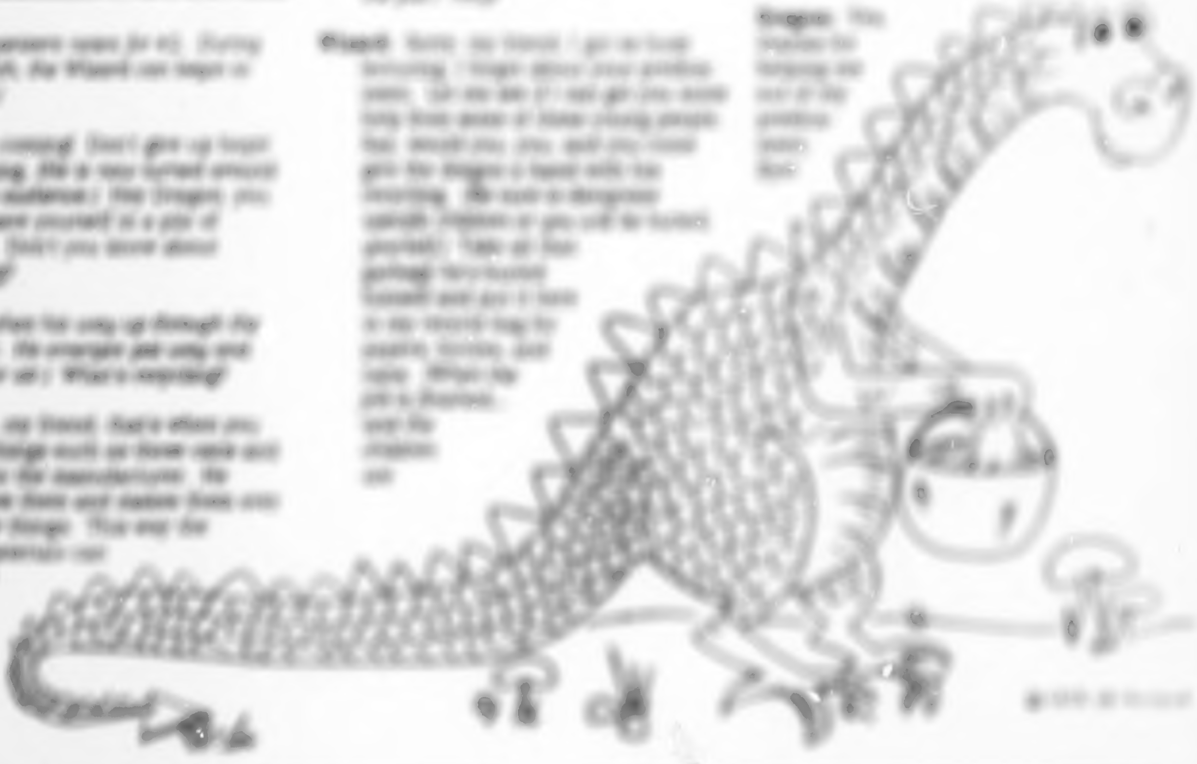
Wizard: Sorry, my friend, I got so busy lecturing, I forgot about your problem *(pause)*. Let me see if I can get you some help from some of these young people. Say, would you, you, and you come give the Dragon a hand with his recycling. *(He asks 3 designated [illegible] children or you will be buried [illegible].) Take all that garbage he's buried himself with and put it back in my recycle bag by plastic, bottles, and cans. When the job is finished, and the children are seated... the Wizard continues.)* Well Dragon, what do you have to say for yourself?

Dragon: My goodness, friend Wizard. I had no idea I could get buried under all that garbage. Progress can be a good thing, but I'd sure be glad to give it all up and go back to my old lunch basket and water bucket. I guess sometimes you can get too much of a good thing.

Wizard: Yes, I guess you could even say that sometimes progress is just a lot of garbage. *(He turns to the children.)* How about you young people out there? Do you have any ideas on how you can cut down on your lunch time throw aways? What things can you substitute for paper bags, plastic bags, and cans and bottles? What do you do with things which must be thrown away? I'm sure you have some good helpful ideas. Let's hear them, as well as any questions you may have. *(Remember a discussion may be held with the children. The Dragon, the Wizard and the Narrator can ask and answer questions.)*

Narrator: Thank you all for your help and answers.

Dragon: You [illegible] for helping me out of the garbage [illegible]. Bye.



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How to Adopt a Stream

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

THE FIVE STEPS OF STREAM ADOPTION

1. [illegible]

[illegible]

2. [illegible]

[illegible]

[illegible]

3. [illegible]

[illegible]

4. [illegible]

[illegible]

5. [illegible]

[illegible]

[illegible]

[illegible]

THE GREEN PAGES:

ENVIRONMENTAL EDUCATION ACTIVITIES K-12

GRADES K-3

Science

[illegible]

[illegible]

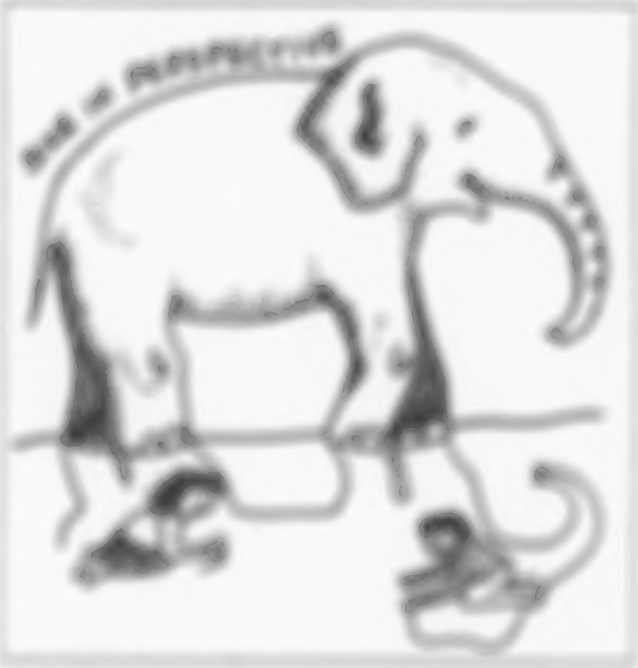
[illegible]

[illegible]

Mathematics

[illegible]

[illegible]



Social Studies

[illegible]

[illegible]

[illegible]

[illegible]

Language Arts

[illegible]

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[illegible]

Fine Arts

[illegible]

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[illegible]

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GRADES 4-6

FUZZY ANIMALS

Science

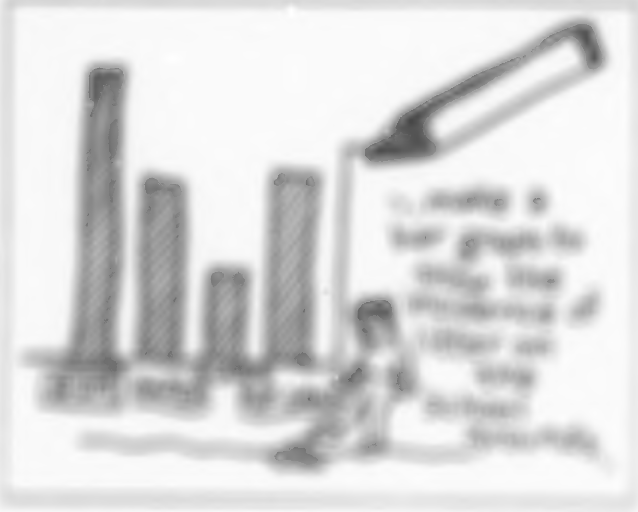
[illegible]

[illegible]

[illegible]

Mathematics

[illegible]


...make a bar graph to show the incidence of litter on the school grounds.

[illegible]

Social Studies

[illegible]

Language Arts

[illegible]

Fine Arts

[illegible]

GRADES 7-9

Science

[illegible]

[illegible]

[illegible]

[illegible]

Social Studies

[illegible]

Mathematics

[illegible]

Language Arts

[illegible]

Fine Arts

[illegible]

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[illegible]

[illegible]

GRADES 10-12

Science

[illegible]

[illegible]

Mathematics

[illegible]

Social Studies

[illegible]

Language Arts

[illegible]

Fine Arts

[illegible]

CLEARING

[illegible]

Twenty Going on One Hundred:

What Now for Environmental Education?

[illegible]

[illegible]

[illegible]

> [illegible]

[illegible]

[illegible]

[illegible]

Twenty Going on One Hundred

[illegible]

[illegible]

An Approach for Environmental Education

[illegible]

curriculum in schools. It need not. Most think it is exclusively science, and it is not that either. We must describe an EE that is infused into the K-12 curriculum in all subjects.

We must train pre-service teachers in EE so that they can contribute to the EE effort from day one in the classroom. This means addressing colleges and departments of education. The task of making an environmental educator out of a teacher-in-training who is not set in their teaching ways is vastly simpler than "retraining" someone through in-service workshops.

But we must do that, too. My own idea is that we need to undertake a project to create simple, straightforward manuals that will help teachers painlessly integrate EE into their work in science, language arts, art, reading, math — in all subjects. Workshops should be designed to introduce these manuals to in-service teachers, to orient them to the need and the approach, and to show them how easy it will be to infuse EE into their instruction.

This takes money, as there will be some political spadework to do, but the sums of money needed are not vast. EE can be achieved relatively inexpensively. We must not let anyone use the excuse that there is not enough money for environmental education. Effective EE can be achieved on a relatively low budget.

We must also convince media that the "environmental story" is everywhere, that it is their duty to help people understand the issues, not simply to "tell the story." Somehow the importance of biological diversity, for instance, can be understood in all the rhetoric about the Northern Spotted Owl.

Resource and environmental management agencies, like the US Forest Service, the Department of Natural Resources, and the Department of Ecology, have a big role to play in this effort. They must mount efforts of their own in their various areas of their special expertise. I would caution them, however, to avoid the temptation to use education as a substitute for necessary regulation and "command and control" measures. I would caution them to not fall into the trap of thinking that EE is "public relations" or "information."

As we gear up in this state for a major EE effort, we should examine systems already in place which have experience at delivering education and information to the grassroots. We don't have the time and money to reinvent delivery systems that have proven their value.

We should debate and discuss and argue about EE, what it is and what it should be, but we should always be partners. We should create partnerships involving the private sector, business, industry, non-profits, universities, community colleges, environmental groups, state and federal agencies, and anyone else who has something to contribute. This will not be easy, because humans and their institutions are territorial beings and like to establish turf and defend it religiously, but we must transcend this. And we can.

I have a few thoughts in conclusion.

1. The work of environmental education is hard work. We must be immersed in the grim statistics of massive problems. We must fight feelings of futility and depression derived from a constant menu of bad news. We must keep going when we are not sure we are achieving anything because our goal is so large and far off and hard to measure. It is hard because we know that being a doomsayer does no good, that we

natural sciences, social sciences, and the humanities.

Environmental education should be problem-focused and oriented to decision-making. Learners should become involved in real environmental problems or issues which are broad enough in scope to have regional, national, or global significance. Environmental education should engage learners in values clarification, problem-solving, planning, and decision-making processes. This must prepare them for dealing with environmental problems that affect both individual life styles and societal goals.

Essentially, Far West believes that the goals of Environmental Education can be achieved through a model of instruction that is based on a general systems approach. Such a model can show the many interactions that exist within our natural environment.

We have chosen to display the ten core themes of Environmental Education in the following chart. It is not possible to study absolutely everything about the environment and its problems. Therefore, we suggest that educational planners focus on these ten themes, across the K-12 grade span, as they work to accomplish the four goals and their related objectives.

Planners are encouraged to use the following chart as a checklist to identify and specify the content of instructional units.

The 10 Core Themes of
Environmental Education
(A Conceptual Structure)

1. AIR QUALITY
2. WATER QUALITY
3. SOLID AND LAND USE
4. PLANTS, FOOD AND FIBER
5. HUMAN POPULATIONS AND SOCIETY
6. WILDLIFE AND DOMESTIC ANIMALS
7. HAZARDS
8. MINERALS, ENERGY AND RESOURCE RECOVERY
9. AESTHETICS AND THE BUILT ENVIRONMENT
10. COMMUNITIES AND ECO SYSTEMS

Reprinted from Environmental Education Guidelines for Washington Schools, a publication of the Office of the Superintendent of Public Instruction, 1987.

Twenty Going on One Hundred

continued from page 9

must present a hopeful and confident front.

3. So how do we keep at the task and avoid depression? There are many ways, but my guess is that most of us find solace, inspiration and energy in the natural world. John Muir returned throughout his life for renewal in the mountains. "Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves."

Henry Beston put it this way:

> *"Hold your hands out over the earth as over a flame. To all who love her, who open to her the doors of their veins, she gives of her strength, sustaining them with her own measureless tremor of dark life. Touch the earth, love the earth, honour the earth, her plains, her valleys, her hills, and her seas; rest your spirit in her solitary places. For the gifts of life are the earth's and they are given to all, and they are the songs of birds at daybreak, Orion and the Bear, and dawn seen over ocean from the beach."*
> -from The Outermost House

Finally, I ultimately have faith in our humanity. I am not a religious person in the conventional sense, but I believe we humans are different from the rest of nature. We are blessed and burdened with consciousness and choice. We are evolution conscious of itself. Aldo Leopold, A Sand County Almanac, taught us that "an ethic, ecologically, is a limitation on freedom of action in the struggle for existence. An ethic, philosophically, is a differentiation of social from anti-social conduct. These are two definitions of one thing." He taught us that we are in an ecological struggle for existence, and that we can, if we will, choose to survive.

Rolf Edberg, an eloquent Norwegian diplomat, made the point another way:

> *"Man is also the only being who can affect his own evolution, and that knowledge is a child born of the present generation. He has reached a stage at which he not only can but must take the responsibility for his own continued development and for his planet home. The obligation to do this was the price of his knowledge. There is no way back."*
> -from At the Foot of the Tree

I have faith that we can and we will choose to survive. We will achieve an environmentally sustainable global economy. We will restore places we have damaged, control population and find ways to everywhere define and satisfy human needs. After 20 years of intense study of humans and nature and the relations of the two, I am an optimist.

Rolf Edberg again:

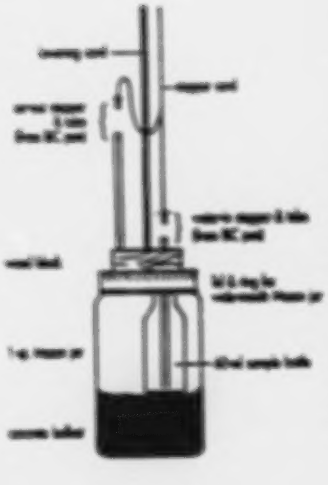
> *"We are moving over the narrowest isthmus of time, guided by knowledge bursting with risks. We can no more quit ourselves of it than we can leap over our own shadows. Individuals may spurn development, species cannot. The relevant question is, how we make use of our knowledge."*

We environmental educators will have much to do with how we make use of our knowledge. □

Share your ideas!

LOW-COST HOMEMADE ENVIRONMENTAL EDUCATION TOOLS

Here are some ideas for low-cost environmental education tools that you can make with simple materials found around the classroom or home. This may become a regular section of CLEARING, so if you have any similar items that you have made yourself, let us know about it and we will include them in a future issue. Most of the items on these pages were gleaned from two sources: The Volunteer Monitor, published by Adopt a Beach, 710 2nd Ave., Suite 730, Seattle, WA 98104 and OBIS: Outdoor Biological Instructional Strategies, Lawrence Hall of Science, University of California, Berkeley, CA 94720.



Wisconsin Self-Help Sampler

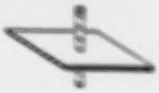
The Wisconsin Self-Help Sampler — designed by Paul Anderson, a volunteer in the Wisconsin Self-Help Lake Monitoring Program — can be used for more critical testing, such as dissolved oxygen or CO2. It can be made for one-tenth the cost of commercial equivalents such as Kemmerer or Van-Dorn bottles. The sampler, which ingeniously uses tubes and stoppers from BIC pens to create a system for separate water inflow and air outflow, allows for the proper flushing rate to fill a 60-ml BOD bottle.

- from The Volunteer Monitor

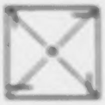
Wind Speed Measurer

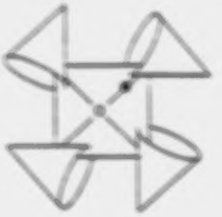
1. Collect several dozen paper "snow-cone" cones from a local supplier or variety store.

2. Take a thin but firm square piece of cardboard, find the center, and poke a hole that will fit snugly over a six inch straw. Use tape to secure the cardboard on the straw.



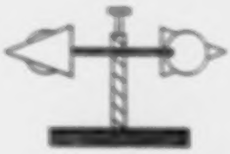
Cut four slots in the cone holder like this:





Slide a cone into each slot. Be sure they all face the same direction.

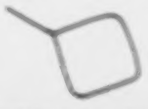
Make a base using a thick piece of cardboard. Run a nail through the straw and stab it into the cardboard base. The cones should turn freely in the wind.



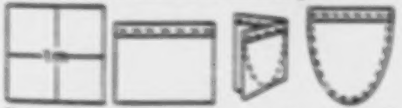
- from OBIS

Sweepnet

1. Take a wire coat hanger, straighten the hook, and pull the hanger into a square.



2. Your net should be approximately one meter in circumference at the top, tapering down to a point. A sewing machine speeds up constructions, but older kids can hand sew the nets if sufficient time is provided. Sew like this:

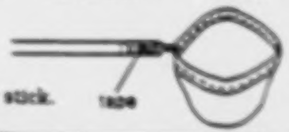


Fold one edge down and sew

Fold square in half and sew

Cut off excess

Thread the net onto the wire and attach the wire hoop to a broom handle or other stick.



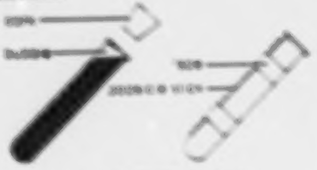
Slope Measuring Device

Slope can be determined by fixing an anchor point at the upper part of the slope, drawing the one meter cord taut, sliding it up or down until the cord is level, and reading slope directly in cm/meter.

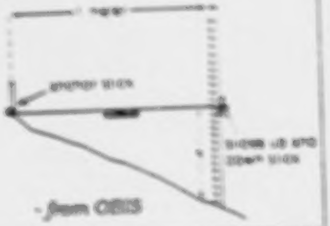
1. Sharpen a 25 cm. stick and fasten the cord to it with a knot which can slide up and down the stick.

2. Attach the free end of the cord to the meter stick so that the distance between the two sticks is one meter, and the cord can slide on the meter stick. You can mark off centimeters on any stick if you do not have a meter stick.

3. Make your level. Fill a test tube almost full of water and add a drop of ammonia. Cork the tube so that a small bubble remains. Trim off top of cork. If your test tube has a flared lip at the top, tape a popsicle stick to the side of the tube before taping the level tube to the center of the cord.



4. Assemble all pieces and use like this:



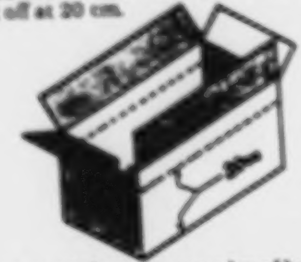
slope = x cm/meter

- from OBIS

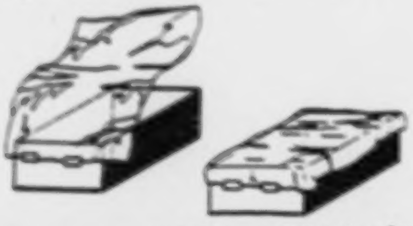
View Chamber

This box can be used to observe small insects and other creatures without harming them. This could be very useful in groups of young children, whose enthusiasm may endanger the creatures' safety.

1. Get a box about 30cm wide by 50 cm long.
2. Cut box off at 20 cm.



3. Tape a piece of plastic to one edge of box.



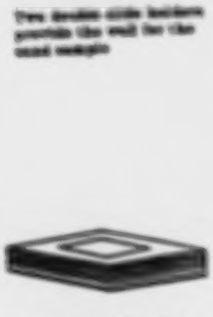
4. Pull plastic over top to hold animals inside. *- from OBIS*

Sand Display Module

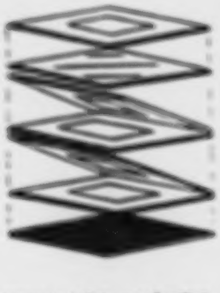
This simple construction will allow you to display sand samples that you have collected from around the world (or at least around your state!)

Using slide mounts without the slide material, you can create a shallow well for holding the sand. This can be sandwiched between two slidemounts with clear film to hold the sand in. Glue the pieces together with sand inside.

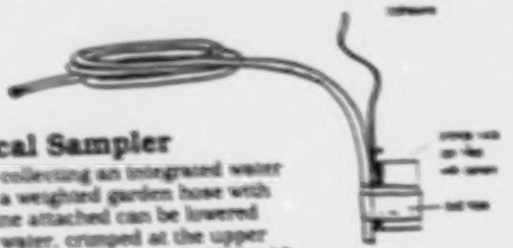
- from Hastie and Williamson


Two double slide holders provide the well for the sand sample

Assembled well mount



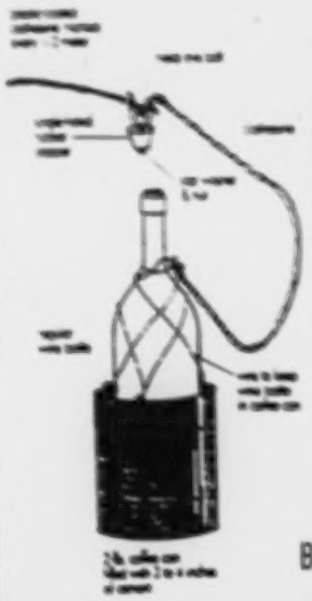
Exploded diagram showing assembly order.



Vertical Sampler

For collecting an integrated water sample, a weighted garden hose with clothesline attached can be lowered into the water, crimped at the upper end, pulled up, and emptied. Use a 10 m. length of 1/2 to 3/4 inch hose with the metal connector cut off one end. Mark the hose at 1 m. intervals with plastic cable ties.

- from The Volunteer Monitor



Meyer Bottle

The modified Meyer bottle sampler is stoppered and lowered into the water. When the sampling depth is reached, tug to release the stopper. The bottle can be used to sample for nutrients or plankton, or to measure physical conditions with depth. Smaller bottles may be used for monitoring low streams.

- from The Volunteer Monitor

Exemplary E.E. Programs
in the Pacific Northwest

Eddyville Students Return to Their Roots

by Jeff Mitchell
Eddyville School

At Eddyville School, students learn to appreciate trees all year long. Located on the west slope of the Coast Range in northwest Oregon, the school is surrounded by second growth timber and open pasture. The 200 students who attend are drawn from the small farms and homesteads in the surrounding hills and valleys, and all of them have a favorite apple tree. In 1985 an idea was planted along with a few seedlings. Today that idea has flourished into a productive apple orchard. It has become a vital and visual testimony to the early settlers who first brought the many varieties of apples to the Northwest.

In an effort to save some of the best old apple varieties found in the pioneer homesteads in the area, students in the high school horticulture class collected scionwood (cuttings) from their favorite trees during the winter. Students grafted these scions onto rootstocks which produce full sized fruit but reduce the size of the tree for easy maintenance. On a one-acre site that was the location of Eddyville School during the pioneer era, students fenced and planted 100 trees of 50 different varieties in a historic and scientific testimony to the early settlers.

There are four major goals of this project. All are built in to a long-term learning outcome for our students. The first is to preserve the genetic diversity found in the old pioneer orchards, most of which are very old and declining. By grafting scionwood from these old trees onto dwarf and semi-dwarf rootstocks, the identical characteristics of the apples have been preserved on young vigorous trees, all in one appropriate location.

Exemplary EE Programs

A second goal is to provide fruit for the school lunch and snack program. We hope to encourage an appreciation for the variety of fruit that can be grown in our area. Imagine students biting into a freshly picked "Pink Pearl" apple one week and a "Golden Gem" the next to see how an enthusiasm for exploring fruit can be generated during the lunch hour.

The third and most important goal of our orchard project is to make horticulture practical and offer the opportunity for scientific inquiry. The class currently experiments with various food and cover crops in the school garden and greenhouse. An orchard adds a new dimension: a perennial experimental plot. Students are totally responsible for the maintenance of the orchard. For example, pruning methods such as the modified leader, fruiting wall and espalier are taught and practiced. With the recent addition of small fruits such as kiwi, grapes, gooseberries and currents to the orchard, students gain practical experience in many facets of pruning. Other areas of student learning include irrigation, fertilization, pollinization, harvest and care of fruit and the grafting technique itself. Disease and pest control are carried out using Integrated Pest Management (IPM) where regular monitoring and the ability to recognize potential pests are the key to control. Apple leaves are examined regularly under a microscope to compare densities of pest and predator mites, pheromone traps are used to monitor Coddling Moth presence, and pruning tech-

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niques are applied to increase air circulation and sunlight penetration to reduce apple scab, a fungus. The orchard is viewed as an ecosystem where balances are carefully maintained. As of this writing, no insecticides or herbicides have been required to control pests.

Finally, the knowledge that students gain in class is shared in the greater community. A monthly school newsletter includes results of horticulture experiments and observations, and recommendations are made on suitable varieties. Since our microclimate is different from the coast or the Willamette Valley, it is important to gain information relevant to our growing area. For example, an old pioneer apple variety known as Vanderpool has consistently given the very best results as a "keeper" apple. They will stay crisp and unblemished stored in a box in the garage or woodshed until April, while all other varieties have rotted. This is an important quality to a rural grower who may not have access to a climate-controlled cooler and wants to keep apples for spring use. Over one hundred Vanderpool trees have been grafted and sold to community growers since our "keeper experiment" results were made public.

In the Talmud there is a story of Honi, a young boy who comes upon an old man planting a tree and with youthful curiosity asks him what he is doing. "I am planting a bread tree," he replies. "The fruits of this tree can be made into bread." "And when will it bear fruit, your tree?" Honi asks. "In seventeen years and seven," the old man answers. "But surely you will not live that long," responds Honi. "Yes, I will not live that long, but I must plant this tree," says the old man. "When I came into this world, there were trees here for me. It is my duty to make sure that when I leave, there will be trees here also." In the same way the pioneers planted their trees for our generation to havest. Eddyville students are learning to care for the trees that will feed their grandchildren.

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Kettle Falls Elementary: Learning About Native Cultures and Crafts

by Dwight Morgan

Dwight Morgan's class in Kettle Falls, Washington recently erected their 100th wood duck box and their 2,300th songbird house. This class is a project oriented with a seasonal emphasis. While the class is a traditional, self-contained fourth grade, projects in and out of the classroom are an important part of their week.

Activities focus on the local ecology and tie these to environmental issues on a more global scale. Native American culture is studied in social studies, for example. Students step back in time by collecting roots and other foods from the local area, brain-tanning deer hides, manufacturing stone tools and traps, and culminate with a campout in shelters simulating the Plateau culture tipi. Students cook their meals during the day and stay out one night. Students also look at changing patterns in other cultures and relate these to their own community.

The new jargon of Whole Language and cooperative learning are not really new to many teachers as skills from one subject are used in the next area and students help each other throughout the year. Older students are used on field trips to work with students new to areas of study. A field trip to a tree farm in the Spring sees the students planting trees and making decision about thinning and pruning. Trees which the students mark are cut and removed while the students are present and the decisions they made are then discussed. Students make group related decisions as well as individual decisions about the management of the timber stand.

In the areas of observation and identification, students in this fourth grade class learn to identify animals, plants, and birds as well as age classes of these to aid in their gathering of information about populations. Students collect data about roadkills and use these statistics to predict populations of, for example, white-tailed deer. They take this information and compare it with their visual observations or fecal counts.

Within the classroom, Project WILD materials are used. Aquariums are set up using native samples of pond life, rather than exotic fishes. Students find this very interesting, for example, when a water bug preyed upon their two inch trout. As one student put it, "Wow, we swim in the lake that insect inhabits!"

Sports also come into play within this classroom. Lifetime sports are extra activities. Cross-country skiing and fishing are taught and these skills are used within the program to gather information and stay fit.

Students are also involved with the reproduction of histotical items such as blacksmithed camping equipment which they manufacture in the high school shop for their campouts. They are also assisting in the construction of six Fur Trade era firearms for the museum near Kettle Falls.

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Exemplary E.E. Programs
in the Pacific Northwest

An EAGLE classroom plants a tree with the help of the Greenway's maintenance supervisor. They learn propoer planting techniques, as well as care and feeding.

EAGLE — The Yakima Greenway Foundation's Educational Outreach

by Cec Vogt
Public Relations Director

Students in 250 K-5 classrooms throughout the Yakima Valley in central Washington are learning about the environment using the Yakima Greenway as their lab.

The Yakima Greenway is a 3600-acre land trust along 10 miles of the Yakima River. It is home to natural areas of abundant wildlife and vegetation as well as 4.6 miles of paved pathway and several parks.

The Greenway is developed, maintained and operated by the nonprofit Yakima Greenway Foundation, whose major focuses are conservation, recreation and education.

Education comes in the form of the Foundation's E.A.G.L.E. program: Environmental Awareness Greenway Led Education!

The project began three years ago as Young Citizens 2000 for kids graduating from high school in 2000. It was the brain child of retired educator Helen Peterson and community activist Greta Bryan. Both women are advocates of children, education and the Greenway — the perfect team to create and lead the project! They formed a committee and went to work. About 30 first grade classes were involved that first year in tree planting and other activities, with one or both of them meeting with each class.

The stated goal of the project was (and remains) "To enhance knowledge and appreciation of the natural environment and to promote habits, skills and attitudes which will lead to the appreciation and preservation of our natural environment."

The 1989-90 school year reached both first and second grade classes with a newsletter-format curriculum that included facts, activities, cartoons, history of the Greenway and discussions of a variety of concepts, including public property, volunteering and conservation. The name E.A.G.L.E. was adopted, as Young Citizens 2000 didn't apply to both grade levels.

Enrolled teachers received an update in the spring with a list of resources and more activities and information. Sixty classrooms were involved; all who performed an environmental activity became honorary members of the Foundation.

That spring the Foundation received a grant from Yakima Downtown Rotary to fund the program. Monies were used to hire teachers to create curriculum guides for grades K-5 that will be usable year after year. As the students move through elementary school, they will get more sophisticated information and projects that will help meet E.A.G.L.E. objectives.

The objectives are: 1. To learn about the Yakima Greenway as an illustration of the community's endeavor to preserve, appreciate, enhance and enjoy the Yakima River and its corridor. 2. To build the students' habits, skills and attitudes regarding litter control, preservation of the river corridor and clean air and water. 3. To help students know and appreciate nature. 4. To give our young people a sense of ownership for the Greenway, and all public property, with the goal of reducing future vandalism.

The four-year Rotary grant will allow the work to continue — this summer a group of middle school teachers will work on guides for grades 6-8. The following summer curricula will be developed for high school and finally pre-school and early childhood guides will be created.

The guides are formatted in an easy-to-use newsletter style with a consistent look for all grades. Staff at ESD 105 were responsible for putting them together, and they are beautiful! Teachers may request the guides from either the Greenway office or the ESD Reader Service. Over 250 were sent out this year.

Each student in the program receives a sticker that reads "I'M LEARNING ABOUT OUR ENVIRONMENT!" Many classes will come out to the Greenway in April and May to plant trees, picnic, learn and play.

Of course, the best part of the program is the way it involves the teachers, kids and families. Techers

Each child drops a handful of dirt over the roots.

Exemplary E.E. Programs
in the Pacific Northwest

EAGLE students learn about the ill effects of litter — first hand!

are encouraged to send home copies of the guide. Kids learn what they can do at home, school and the Greenway to make a difference. All of the guides contain some common material including the goals of the program, Greenway map and description of facilities, resource lists and photos.

In addition, each guide is tailored to the interests and capabilities of the students at that grade level. For example, kindergarten and first grade students learn how to prevent litter and are encouraged to cooperate in a school-wide recycling project. The "Enduring Litter" chat is printed in their guide.

Second graders are taught to protect our water supply by turning off water when brushing teeth and to sing shorter songs in the shower!

Third graders are taught map skills with the Greenway map and language arts skills such as the Haiku:

Trash was left to rot
Volunteers came to clean up
The Greenway appeared!

Fourth graders are encouraged to use their senses to take in all the wonders of nature and to make a commitment to action with a conservation pledge:

> *"I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country — its soil and minerals, its forests, water and wildlife."*

Fifth graders have a Greenway leaf lab project involving collecting and charting leaves. While visiting the Greenway they also work on the concepts of speculating, observing, visualizing, describing and so on.

We hope that every child who is exposed to this program will develop an environmental awareness and become a better citizen. As a result, our Valley and the world will be a better place in which to live!

You can write to the Yakima Greenway Foundation at 103 South Third Street, Yakima, WA 98901.

Strange Bedfellows:
Moscrop Secondary School

Burnaby, BC

by Marlena Morgan
Jim Ried
Geoff Watt

An English teacher and a Science teacher developing and team teaching an Environmental Studies course? It may sound like a script idea for "The Twilight Zone" but it's a fact at Moscrop Secondary School in Burnaby, B.C.

In 1990, Moscrop students saw the need for an Environment Committee and seven grade 10 students and two teachers assumed leadership. During the year, involvement was high and, in June, a major evening and day conference were held.

Out of the Environment Committee's leadership, student interest grew. The next logical step was to offer an Environmental Studies course. Now, 34 grade 9 and 10 students and three teachers are involved. Next year there will be an advanced Environmental Studies course to meet the needs of the students who wish to go into more depth, as well as the course which has been developed in 1990-91.

One of the problems with an Environmental Studies course is that few guidelines exist. Basically, the teachers involved "invent" the course. There are resources available and "wading through" them, evaluating them and choosing among them is a time-consuming task.

Therefore, in order to formulate a sense of direction, the team met and worked on developing a framework for the course. Since it involves integration of Science, Social Studies and English, this was a challenging task. However, the difficulty was eased by the fact that all team members agreed that a sound knowledge base was essential for students. Without a sound knowledge base, understanding and action are both difficult. And, since understanding and action are the two most important (to this particular team) elements of an Environmental Studies course, a sound knowledge base became a priority!

The framework for the course, as it was developed, involves five strands — the Science strand, the Social Science link, the Socials strand, the English strand and the Personal Application (self, school, community) strand. The working course outline, as developed by the team, delineates the strands and shows their interconnectedness.

In a short article it is impossible to give a great deal of information about the course as it evolved. However, the materials which were piloted will become public domain in the Fall of 1991 and copies may be obtained through the Education Innovation branch of the Ministry of Education, Parliament Buildings, Victoria, B.C. (Refer to Intermediate Developmental Site #68). There will be a great deal of useful material available for individuals or teams considering the idea of developing a course in Environmental Studies.

If you are currently involved in the development of an Environmental Studies dcourse and are just looking for a few "new" ideas, here are some which have worked for us!

Finding a "textbook" is very difficult. We are Using Gaia: State of the Ark Atlas (Lee Durrell, Anchor Books, Doubleday, New York, 1986, $22.95 Cdn., $17.95 US). Students' response to this book is excellent. They are intrigued by the layout which features short sections under umbrella themes; delighted by the photographs, charts and maps which are very interesting; and are overwhelmed by the fact that there are "no questions at the end of the chapters!"

Media resources are also very important as we are, like it or not, living in a time when visual images are as important as print. The PBS series "*Race to Save the Planet*" is very useful. Buy it! It can be used effectively in "pieces" or it could be the base of a course for advanced students. Another very useful and though-provoking video is the National Film Board of Canada's production of "*Adam's World.*"

One of our very successful events was our Mythology unit. Mythology provides us with an understanding of the relationship between human beings and their environment. Joseph Campbell's book The Power of Myth is indispensable as it covers everything from comparative creation myths to planet mythology and provides inspiration for a human (and humane) analysis of our historical "connectedness" to the planet. "Goddess Remembered" (National Film Board of Canada) is a useful video to use in conjunction with a mythology section. The "leap" to the Gaia hypothesis from mythology becomes a "small step."

The Personal Application strand has also been emphasized. The Environmental Studies students have done everything from selling reusable lunch bags to participating in a famine experience. Currently we are working on analysing a local lake and preparing an ecosystem for our school grounds.

Perhaps the most exciting part of developing the Environmental Studies course is the realization that it is an ongoing process. Next year's course will see a slight shift in the framework and use of some different resources. But, the basics which we developed in Year 1 will remain as the core of the course.

If you want further information before the materials we developed become public domain, contact:

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4433 Moscrop Street
Burnaby, B.C.
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Phone: (604) 437-1287
Fax: (604) 437-6573

If you or someone you know has a school-wide or classroom environmental education program that deserves recognition in CLEARING, please call us at (503) 656-0155 — or — send us an article accompanied by black and white photos (address on back cover).

Alaska's Discovery School: Restructuring Around an Environmental Theme

by Bruce Tillitt
Alaska Science Consortium

Housed in this town's oldest building is a dynamic, young program called "The Discovery School." Denali Elementary, in Fairbanks, Alaska, has taken on the challenge of developing a K-6 science curriculum that is interdisciplinary in nature, environmental in theme, and multicultural in outlook. Cited in 1990 by the Alaska State Department of Education as an exemplary program in science education, Denali has recently been awarded a $748,000 grant by the RJR Nabisco Foundation to pursue its dream.

Development of a vision

How does a school begin the process of restructuring? Why did a 'typical' city school, with an 'ordinary' staff, take on the responsibility of developing an environmentally-aware, interdisciplinary and multicultural curriculum? The answers to these qustions have something to do with the process we have initiated, and with the kind of leadership we have in Fairbanks.

When David Hagstrom became principal at Denali three years ago, he began a proces sof open meetings to discuss what type of school Denali had always been, and what type of school we wanted to become. He helped us reaffirm the good things we had here, while opening the doors to doing things another way.

We began the '88-'89 school year by meeting once a month at 6 a.m., in the home of one of our parents. We invited staff, parents, university and community members to these informal discussions. Out of these meetings a consensus grew that we wanted a science focus for our school, and that we wanted to develop in ourselves and in our children an environmental ethic:

> *We have chosen to begin with our hopes for Alaska. It seems to us that Alaska is in a time of reassessment. As Alaskan people, we're going to have to become engaged in a dialogue with one another about our priorities. To what degree are we going to exploit Alaska? To what degree are we going to preserve Alaska? Just how much more are we going to take from this great land... and how can we begin to give to this special place that we call home? It seems to us that it is high time that we developed a new respect for our special home, and we must develop new understandings about the nature of the land that is Alaska.*
>
> *We feel that we need to create a new balance in terms of our attitudes towards the resources and our basic life necessities. We need some new discoveries... not only within the land... but in ourselves. We must discover how we might be givers as well as takers. We must discover Alaska anew. And, we must discover again who we are as a people. If this is our mission as Alaskans, what are the implications for our schools?*
>
> *As a school community, we feel that as we redefine Alaskan quality of life issues, we must redefine the nature of our school. As Alaskans begin to reassess and redefine, it is not going to be possible for schooling to continue operation with a "business as usual" attitude. We believe that Alaska must change... and our school must change.*[1]

In May, 1989, we presented our plan to become a science-focus school to the School Board. The Board voted to approve our plan and to fund Denali as a science "magnet school," as described below.

During that spring and into the summer, a group of teachers and university faculty met to draft an Eisenhower grant proposal for teacher enhancement. Pat Nelson, then with the University of Alaska-Fairbanks, was principal investigator of the original project, which received funding for the school year '89-'90.

We began our restructuring by accepting that we as adults are still learners. We need to continue our education. Our students need to see us as learners, too. Most of all, we need to develop a skill in asking

questions, important questions, questions that go to the heart of the matter, questions that might make us uncomfortable. If we want our children to develop into thoughtful adults, capable of defining a problem, researching solutions, and making in-formed choices, we need to model that behavior. The areas we felt we needed to tackle first were science and computers.

By November of that first year, we had written a seven-year plan, now known as the "green book," that detailed our philosophy and outlined the major activities we planned to undertake. We included a timeline and an evaluation component. This booklet, which we have now had to reprint, has been very helpful in informing the community about our goals, in keeping us focused, and in obtaining outside grant funding. I would recommend writing a long-range plan if your school is undertaking a project like this.

Elements of Success

There are several elements to the success of a school-wide program such as ours. One is the support of the school district. Our superintendent and school board, believing as they do in the power of site-based decision-making and program development, encouraged schools in this district by allocating funds to assist "magnet schools" that would come up with a program proposal. Through District help, we have installed a Macintosh computer network in the building that ties together all classrooms and the office. We were also allowed one additional teacher position, to work with the classroom teachers in science and ensure that the program was able to keep growing and developing on schedule.

A second element of our success is the intimate involvement of the community. Since the beginning planning stages, parents, university faculty, and business leaders have attended meetings and volunteered their services. We have now established a Discovery School Advisroy Board, made up of fifteen people from the Denali community who meet monthly and serve in an advisory capacity to the school.

Accompanying the involvement of the community is a shared leadership style that David brought to the principalship here. More than lip service is given to teacher and parent input in the decisions made at Denali. Their advice is routinely sought in many matters, ranging from program enhancement to staffing. I think that this shared leadership is vital if a school wants to involve everyone: parents, teachers, staff, community — all need to feel that the program belongs to *them*. Change cannot be ordered to occur. Growth cannot be mandated.

Going Forward

What should a school do to enact change? From our experience at Denali, I would recommend that you begin the process by pulling your entire school community together to talk and to decide what your school priorities are. You have to develop your own plan for your own school. You cannot simply adopt another school's plan with out modifying it. You must be patient with this part of the process and remember that it will not work if you don't have everyone pulling in the same direction.

You need a school leadership team that has a vision of reform and a willingness to do things a new way. With administrative support, it will be possible to overcome the many roadblocks that may cause a program to stumble. Most of all, we in education need to regain our ability to dream, to think beyond the "you-can't-do-it-that-way"'s and the "we've-always-done-it-this-way"'s. We're used to working hard — *very hard* — for the children we see every day. What *couldn't* we accomplish if we worked just as hard at developing our *teamwork* and our *dreams*.

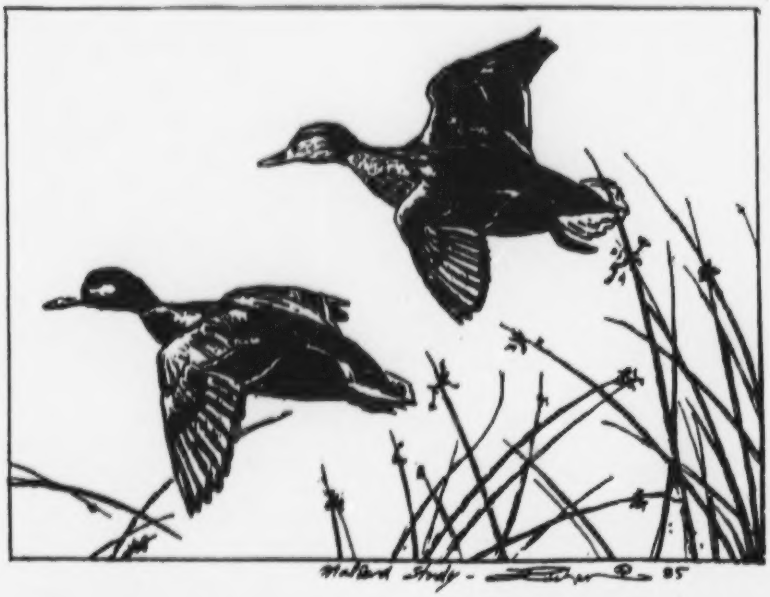
CLEARING
environmental education in the pacific northwest

Meeting the Mandate:

Where Do We Begin?

Environmental education is now required in Washington schools. How do teachers go about making it a part of their curriculum?

by Tony Angell
Supervisor
Office of Environmental Education
Seattle, Washington



From the sketchbook of John Pacher, Mill Pond Press

With the enactment of the Environmental Education amendment to the Mandatory Areas of Study in the Common School, the Washington State educator may well be asking him/herself a number of questions. First among them would be "just where is environmental education to be taught in the Common Schools of Washington State?"

As part of the Washington Administrative Code (WAC) for Mandatory Areas of Study in the Common Schools and pursuant to RCW 28A.230.020 it is required that "instruction about conservation, natural resources, and the environment shall be provided at all grade levels in an interdisciplinary manner through science, the social studies, the humanities, and other appropriate areas with an emphasis on solving the problems of human adaptation to the environment."

This action, taken by the elected body of the State Board of Education during a series of public meetings through the 1990-91 school year, became law in September 1991. Much credit is to be given to the State Superintendent Judith Billings and the State Board for their leadership here. The action places Washington State in the forefront among states taking such an initiative. Only Wisconsin and Washington State have made interdisciplinary environmental education an integral and statutory part of basic education.

Another question would focus on "what does environmental education include?" A suitable working definition has been accepted by the Governor's Environmental Education Council:

> *"Simply stated, environmental education is teaching people about the environment and their*

Meeting the Mandate: Where Do We Begin?

relationship to it. More specifically, its subject matter involves everything we know about the complex and interrelated life support systems of Earth, composed of air, water, soils and other natural resources including a diversity of life forms. Environmental education also reviews the strategies needed to keep these systems healthy and productive, and it considers the personal and corporate responsibilities we have as stewards of the Earth."

-from the Governor's Environmental Education Council

To assist the teacher in developing a broader grasp of what environmental education includes, the Superintendent of Public Instruction has developed Environmental Education Guidelines for Washington Schools. This reference includes "goals" which form the basis of environmental literacy as well as objectives and learner outcomes which provide specific direction for instruction. Included also are useful strategies for implementing and evaluating an environmental education program, and a basic reference bibliography for materials that are easily obtainable and valuable for classroom instruction. Copies of the Guidelines are available free of charge from the Washington Office of Environmental Education (17011 Meridian Avenue N., Seattle, WA 98133).

Now one needs to ask, "where does one go to get assistance and who is available to help?" The news here is good, since over the past few years there has developed a strong network of people and programs, all working to further varying aspects of environmental education. In Washington State, we have the **Governor's Environmental Education Council** which includes, among others, the Directors of the State Resource Agencies, the Department of Health, Interagency Committee for Outdoor Recreation, W.S.U. Cooperative Extension Service, the State Superintendent of Public Instruction and the Governor's Office. This Council has chosen as its 1991-92 school year priority to assist the Superintendent of Public Instruction with the implementation of the State Board of Education Resolution. As teachers, we can expect significant help from the State Resource agencies. This is being provided in the form of classroom resources, grants, awards and instructional programs for teachers.

Another affiliation of environmental education practitioners, the **Environmental Education Task Force**, is composed of members from a wide variety of agencies, institutions, business and industry and foundations. Representing a diversity of environmental education programs, they have been instrumental in directing resources to the educator; coordinating workshops; revising resources; combining efforts and playing a large role in describing the environmental education section of the Washington 2010 Report. Teachers wishing to know more about the Task Force can contact the State Office of Environmental Education.

The **Environmental Education Association of Washington** (EEAW) is an opportunity to affiliate with practitioners from throughout the state and from a variety of backgrounds. With a recent, extraordinarily successful annual conference behind them, EEAW is planning another for April of 1992, during which an abundance of curriculum training opportunities and materials will be provided. Complete with a newsletter and an active network of members, the Association can be contacted through the North Cascades Institute, 2105 Highway 20, Sedro Woolley, WA 98284.

The **State Office of Environmental Education** intends to expand its services as a pivot point in assisting the teacher with information on training, resource materials and curriculum for environmental education. Along with stocks of curriculum on population/growth, energy, water, soils, marine studies, toxics, ancient forests, endangered species, salmon in the classroom, global climate change and the like, there are resource materials available on a loan basis free of charge. These resources include films, videos, posters, fish displays, maps and special equipment (energy monitoring).

In coordination with other agencies and private projects or individuals, the State Office of Environmental Education provides and supports instructional sessions for the aspiring environmental educator. Such courses are being planned for the late Fall and through the balance of the school year. They will continue indefinitely. Specific information on what courses are offered in your immediate area or are coming up on a statewide level can be obtained through our office (206-542-7671) as well as through the education and outreach offices in agencies and organizations throughout the state. Use the EE Resource Directory in this issue of Clearing for names and phone numbers. Course listings are also published in the Math and Science Course Bulletin, available by calling 1-800-635-0520.

For pre-service teachers, discussions are underway with teacher training institutions regarding the development of course offerings for teachers entering the field who need some fundamental background on how to effectively integrate environmental education with their discipline of study.

With the passage of the Environmental Education Resolution and the multiple resources listed above to fulfill its purpose, many opportunities are available to agencies and educators alike. We also have a tremendous challenge before us. The future of our Pacific Northwest environment depends upon our success in the classroom as environmental educators.

As a regular feature of Clearing, we will present articles and information on "Meeting the Mandate" in future issues.
These articles, as well as regular features of Clearing, will help you integrate environmental education into your existing curriculum.

Beyond Bumper Sticker Environmentalism: From Awareness to Action

by Dr. Louis Iozzi
Rutgers University

I think that "From Environmental Awareness to Environmental Action" is a great slogan that, unfortunately, is rapidly becoming a cliche. Clearly, all learning begins with "awareness" and the ultimate goal or end point of learning is usually "action." However, in my view, this slogan implies that awareness automatically leads to action. It erroneously gives the impression that after awareness one magically acquires the needed skills and motivation that lead to responsible citizen action. For some strange reason, all the tough stuff that goes on between becoming aware and taking action is left out. But, you see, it's precisely those missing skills that are instrumental and critically important for moving people from the environmental awareness stage to the responsible environmental action stage.

Let's examine this issue a bit further.

What does awareness mean? Well, for starters the aware individual has some notion that a problem of some degree exists. For example, most people are aware that a solid waste problem exists. However, I'm not sure that very many people know much about it. You'll note that I used the word "know," and, of course, to know is to have "knowledge." So, if we want to move people from simply being aware that there is a solid waste problem toward taking action, perhaps they need to become more knowledgeable about the problem. Agreed? So, how do we make our students more "knowledgeable" about solid waste? Are you ready?

Fact: In the United States, Americans throw out over 400,000 tons of garbage each day. Excluding sludge and construction waste, 160 million tons are tossed out each year. This is enough waste to spread 30 stories high over 1,000 soccer fields. Or, this is enough waste to fill a bumper to bumper convoy of garbage trucks stretching half way to the moon.

Fact: More than 90 percent of this garbage is trucked to landfills. The largest landfill in the world is located in New York City. It covers 2,000 acres and each day 24,000 tons of garbage are taken there and dumped. By the year 2000, this dump will be as high as the Statue of Liberty and fill more cubic feet than the largest pyramid in Egypt.

Fact: In California, the average citizen throws away about 2,500 pounds of trash each year. In Los Angeles County, enough trash is generated to fill Dodger Stadium with garbage every 9 or so days. All garbage dumps in Los Angeles are expected to reach capacity by 1995.

Fact: More than 16 billion disposable diapers containing 2.8 million tons of human wastes are dumped into landfills each year. This amounts to a total of 4, 275,000 tons of discarded waste. What is worse, is that every plastic diaper made since they were introduced in 1961 is still with us; it takes about 500 years for them to break down.

I could go on and on and talk about solid waste problems in other parts of the world where there are similar horror stories. I could talk about nuclear wastes, toxic substance, and so on. But I think what I said thus far should suffice.

Now that we are "knowledgeable" about solid waste, are you motivated to act? I doubt it.

Is that the way many schools try to make people more "knowledgeable" about environmental issues? I think so. As you are well aware, information transfer is the dominant mode of teaching in our secondary schools, colleges, and universities. Surely, those huge numbers were meant to be impressive and to awe students. Instead, they were meaningless to some, boring to many, and probably a waste of time for most people.

I am reminded of days when I was teaching geology. I used to smugly tell the students that the earth was four and one-half billion years old - which by the way, is quite true. Finally, after several years of teaching, I realized one day that my students really couldn't relate to a 4 1/2 billion year time span. In fact, even I couldn't comprehend 4 1/2 billion years! More importantly, if I couldn't comprehend such a long period of time, how could I expect my students to comprehend what I couldn't — and still can't — do. So, I would resort to using different techniques to try to help the students get some feeling for such an incredibly long span of time. For example, I would have the students graph important geological events or dates on long pieces of adding machine paper. The strips of paper would stretch across and around the room. Or I would "help" them by telling them if we were to represent 4 1/2 billion years of time as the distance to New York from Los Angeles, at what point on our map would we place the arrival of humans on the scene?

Did that help? Maybe. Could the students really comprehend 4 1/2 billion years? I doubt it. Could you really comprehend those huge numbers of solid waste I was throwing at you?

However, I have been using another very important word: to comprehend. Obviously, knowledge without comprehension is of little value. I tried, when I was telling you about solid waste, to use a technique that was similar to the one I used when I was teaching geology. Thus, I tried to help you comprehend the huge numbers of tons of waste by relating them to familiar things like soccer fields, the Statue of Liberty, garbage trucks lined up from here to the moon, and so on. But did that help? Maybe. Can you now comprehend those huge numbers? Do you think your students can? I still doubt it.

How could I have made those large numbers even more meaningful? Well, I could have used pictures or slides to show you a landfill. A motion picture film or a video tape might have been even better. After all, Confucius is reported to have said that one picture is worth a thousand words. Why not a thousand tons of garbage? Still better yet, I could have taken you to an actual landfill. I could have also had you do a "Personal environmental

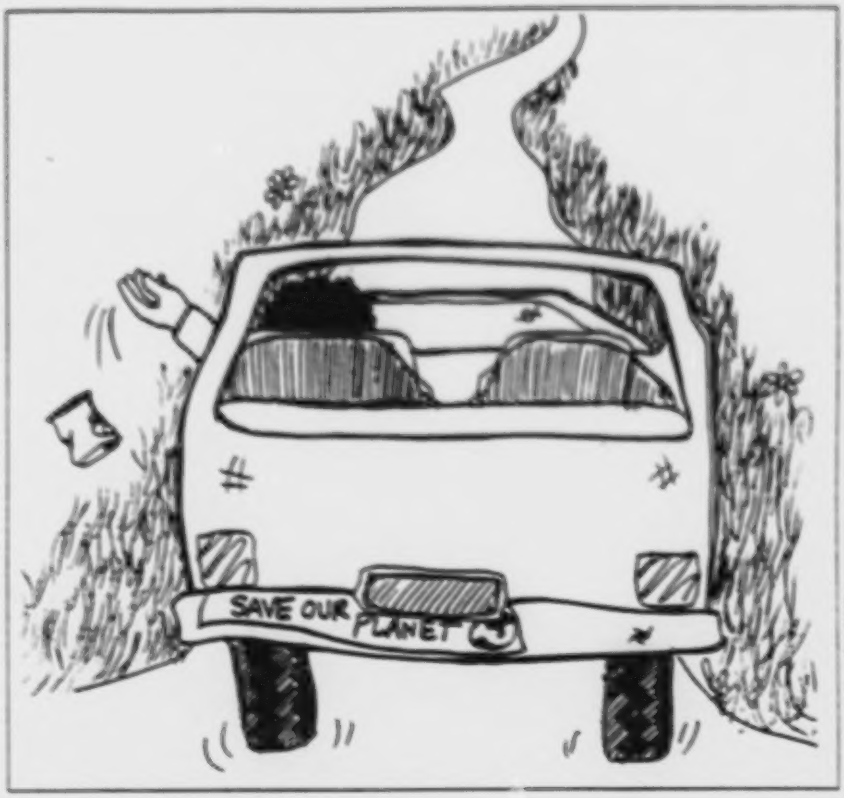


Illustration by Sue Ann Walker

impact statement" in which you would measure the amount of waste you — as an individual — produce each day. I could have you accumulate all the garbage you produce each day. We could then extend our analysis to include the total amount of waste produced by our entire class, our school, our city, our state, and so on. The key here is to make knowledge — knowledge of relevant environmental concepts and problems and issues — comprehensible and meaningful by directly involving students in real life situations. Nothing is more effective, to my knowledge, than direct experience.

There is much more to this knowledge dimension, however. Surely, knowledge is not merely a store of information. Knowledge is both the resource and the product of thought. And if education is to be thought-provoking, knowledge cannot exist apart from the understandings which enable us to adapt our aims and desires to the situation in which we live. And, if we hope to apply our knowledge — or take responsible citizen action — we have to, according to Whitehead, relate our knowledge "to that stream, compounded of sense perceptions, feelings, hopes, desires, and of mental activities adjusting thought to thought, which forms our life." Or, as Dewey once noted, intellectual force does not exist apart from the attitudes, feelings, or emotions which make us open-minded rather than closed-minded, responsible rather than irresponsible. Cognitive processes are inseparable from affective processes and to motivate people to take action we have to involve them in ways that touch them — affectively. We have to involve them in ways that impact on their value systems, that, in turn, motivate changes in lifestyles. Direct experiences with real life environmental problems are critical to impacting the value systems of people.

It seems, however, that whenever anyone mentions that term "values" — particicularly in educational circles — it tends to elicit a lot of concern and confusion. An interesting new book was recently published by Hunter Lewis. In this book, A Question of Values, Lewis elegantly and eloquently simplifies and clarifies for me, at least, the topic of values. He also provides a refreshingly new, exciting and alternative perspective on how we acquire and develop our values systems, and relationship between values and action, and a variety of other topics. In defining the term "values," Lewis notes:

"Although the term values is often used loosely, it should be synonymous with personal beliefs about the "good," the "just," and the "beautiful," personal beliefs that propel us to action, to a particular kind of behavior and life."

"...Environmentally responsible behavior, like ethical behavior is, of necessity, conscious behavior. If we are unconscious of our motives, it is unlikely that we will behave in a consistently ethical (and environmentally responsible) manner. If we are not aware of the particular lens through which we are looking at (our) world, then we do not have any other choice about what we are going to see and how we are going to respond."

As teachers then, we have to make our students "conscious" — not only of thier own lenses, but also the range of lenses. This leads to two results. One is to make it possible for our students to question the validity of our perceptions and values. The capacity for ethical behavior is dependent on the capacity for such self-questioning. If you doubt this, think for a moment: virtually all the evil in the world is committed by people who are absolutely certain they know what they are doing.

The other result is that it enables us to make multidimensional rather than one dimensional simplistic decisions. If we think just logically or just emotionally or just intuitively or only emotionally, then our decisions will be only logical, only intuitive or only emotional. But if we become aware of the variety of different cognitive styles, it opens up the possibility for us to make decisions that are emotional and logical and intuitive. Such consciousness makes it possible for us to integrate different ways of knowing; to think, so to speak, with both our right brain and our left brain, to act with our hearts and with our heads.

Let's summarize. To move people "beyond bumper sticker environmentalism," from awareness to action, we have to: 1) make them aware of the problem, 2) make them knowledge-

Beyond Bumpersticker Environmentalism

(continued from previous page)

able about the relevant environmental concepts, issues that relate to the problem, 3) we must make that knowledge comprehensible to them, and 4) we have to impact them at the affective level. These combined often result in motivating people to take action.

But what kind of action should be taken? How do you go about taking responsible environmental action?

Here we have to be careful.

People seem to do things or take action when they care deeply about something. But we tend to care with our hearts and not, unfortunately, with our heads. Taking action can be problematic if people go off and do things without a knowledge of appropriate and effective action strategies. Surely, then, the next important ingredient is to acquire a knowledge of a variety of strategies before any action is taken.

How do we do this?

The answer to this question relates, in part, to who needs to acquire the skills. If the audience happens to be students in a formal school setting, then the needed skills can be developed by providing opportunities for students to take part in learning activities that use:

- simulations
- case studies
- role play activities dealing with real life environmental issues and problems
- modeling. Teacher enthusiasm is contagious.

Or, why not actually involve students in real life citizen action projects such as monitoring streams, or monitoring air, and water quality — programs similar to those developed by Bill Stapp for watersheds in Michigan and Bill Hammond for rivers and streams in Florida.

The citizen action skills learned by participating in programs such as these can then be applied later to a variety of environment-related community action projects. Unfortunately, these programs only touch the tip of the iceberg. We need many more.

If the target audience happens to be adults or students in a non-formal education setting, then the problem becomes even more difficult. Perhaps an effective way of making adults more knowledgeable is through well produced television programs aired at prime times. Some research appears to support this. Of course, children can have a dramatic impact on their parents' lives. The more children get involved in environmentl experiences, the more likely they will "get on their parents' cases" when they see poor environmental practices. Frankly, my own children were the most influential forces in getting me to stop smoking.

I have achieved a good deal of success using some of the ideas I have presented thus far. However, in reality, the schemes that I just outlined for you are not easy to accomplish. In fact, there are still several other variables that need to be added to the "awareness to action" equation before even a modest degree of success can be achieved.

Surely, one of the most difficult and least researched areas in education — not just environmental education — is how do you motivate people to act on what they know, to act on their beliefs. Of course, people have to first believe that their action can really make a difference. This comes most easily when they acquire experiences — experiences and involvement mostly with success.

While we know some things about moving people beyond "bumper sticker environmentalism," the simple and disturbing fact is that we really don't know nearly enough.

Just as in moral education, it seems that what moves people from environmental awareness to responsible environmental action has also eluded us. Can we afford to give up? I think not.

So, what's the final message in this article? Well, nearly three decades have gone by since "environment" became an important and popular concern in America. During this time, we seem to have stalled at the "awareness" stage and have made relatively little progress toward action. Our environmental education programs and curricula, by and large, emphasize awareness with little emphasis being placed on developing positive citizen action skills. So, my final message is really a challenge. I challenge to all of us to make a commitment, take environmental education beyond the awareness stage of the 60s, 70s and 80s and on to the action stage in the 90s.

Are we up to the challenge? I believe that we have the skills, the talent and the ability to fill in the missing pieces of this puzzle.

Are we up to the challenge? I think so.

What do you think?

Developing a Global Land Ethic: An Educational Challenge

by Michael S. Spranger, Assistant Director, Washington Sea Grant Program, University of Washington

"...Viewed from the distance of the Moon, the astonishing thing about the Earth is that it is alive... the only exuberant thing in this part of the cosmos... It has the organized, self-contained look of a live creature, full of information, marvelously skilled in handling the energy of the Sun..."
Lewis Thomas
Lives of a Cell
1974

Through the eyes of enlightened biologists such as Lewis Thomas, or the small kindred of astronauts that have circled it, the public is increasingly becoming aware of the limited boundaries of its life against the black depths of a lifeless space through color pictures and television images. Unfortunately, they also are discovering the Earth's limited boundaries of life may be reduced, due to their own activities. In fact, the potentially devastating impact of human activity on the global environment has become one of the major international issues of the 1990s. One cannot pick up a newspaper, nor view a television newscast today without seeing at least one story devoted to this issue. These stories focus on such problems as:

- threats to the climate and damage to our populated coasts and social infrastructure due to sea-level rise resulting from greenhouse warming;
- damage to plant, animal, and human health from increased ultraviolet radiation due to the depletion of stratospheric ozone;
- species extinction due to tropical deforestation; threats to marine life and human recreation from coastal and estuarine pollution;
- human, animal, and environmental damage and contamination from nuclear and hazardous waste;
- damage to lakes and forests from acid rain;
- the human population explosion, with its accompanying themes of poverty, famine, and death.

Global environmental change in its many forms has become the new environmental battle cry heard around the world.

However, we must remember that global environmental change is not a new phenomenon. Since the dawn of creation, the earth and its resources, the climate, and the atmosphere have been continuously changing as they constitute a dynamic system. But what is unique is the accelerated changes and the possible devastating impacts to the environment — the result of human actions over the last 100 years in realizing the Industrial and post-Industrial Revolution. For the first time human technology now has the capability of radically altering the global ecosystem.

Why this renewed focus on the global environment by the public media? There are several reasons. Major climatic events of the late 1980s — droughts, hurricanes, major floods, evidence of holes in the ozone layer — brought print exposure, television air time, and international attention to global environmental issues. Also, scientists and teachers in the 1980s began to step beyond their laboratories and classrooms to discuss the ramifications of rapid global change in the public arena which caught the attention of the media and our governmental officials. The result has been a new consciousness on the accelerated changes in earth's systems due to human influence.

As such, the scientific community has embarked on a new research plane that is integrated, coordinated, interdisciplinary, and international in scope. Millions of dollars are being spent on research to increase our knowledge on global change issues. Technological and scientific advances are giving us the ability to measure, model, and predict more accurately what is happening within the earth's dynamic systems. But there still is much that is unknown. Currently there is considerable debate within the scientific community about "facts" and potential impacts of global change. Despite the scientific debate and the uncertainty of future climatic events, national and international decisions and policies are being made to deal with the global climate change issues.

The Educational Challenge

Governmental policies or programs that are adopted need the strong support and actions of everyone in order to be successful. However, many individuals do not have a good understanding of the complex issues, problems, and potential impacts of global change or they are confused by the conflicting, alarmist information of the mass media. Also, unlike what is happening in the research community, there is not yet a large infusion of public funds for a coordinated, integrated, and interdisciplinary education effort. As a result many informational activities are disjointed, and may be based more on emotion than fact.

There is a need for the public to receive accurate, objective scientific information about global change and its implications. Not only do they need to understand the basic science, processes, and impacts of global change, but they also need to understand how collective and local actions can be taken to respond to this issue. Hundreds of scientists from around the world who are working on this issue, as part of the International Panel of Climate Change under the direction of the United Nation's Environmental Programme, unanimously agree on this point.

Envisioned by such eighteenth century philosophers as Jean Jacques Rousseau, John Locke, and John Stuart Mill, government requires that everyone has the right to influence political decisions that affect them. A basic assumption is that everyone is — or should be — essentially equal, in both their concern for public issues and their competency to make decisions about them. However, in order to make these decisions, individuals need accurate and understandable information. Unfortunately, many articles on global change are either sensational, too technical, or too abstract for the student and the general public, or they do not provide a connection between their everyday actions and the impending long-term global changes that may take place.

In addition, in the classroom, many science educaors may teach the "science" of the issue, but fail to give the issue an interdisciplinary focus which also discusses the socio-economic-political elements and ethical considerations. And many social science teachers may talk about the socio-economic-political problems, but lack the scientific education and technical information needed to explain the "science" and how these issues may be resolved. Those educators involved in informal adult education face the same dilemma.

Values and Environmental Politics

Questions each one of us must ask are: If Earth and its resources are being threatened as we are discovering, why do we continue to abuse them? Why do these problems continue, and why does it appear that nothing is being done? The answers lie in understanding the role of values and environmental politics. Any collective or individual action either to protect or exploit the environment are guided by values.

Since we live in a pluralistic society, we have different values which often clash, and are resolved, in the social-economic-political world in which we live. Scientists are also not immune to clashing values. Experts with the same education, professional training, standards, and "facts" regarding global change often disagree. Why? This is because of conflicting/differing values. Scientists may disagree on values just like everyone else. They may differ on the "facts" and courses of action we should take based on how much risk they are willing to accept, both for themselves and for future generations. We must also remember that scientists may disagree on the "science" because scientific "truth" is not a static, closed entity, but rather is an evolving and self-correcting process. Thus, we must remind ourselves that science is a useful tool which can illuminate the issues, impacts, and possible solutions to public problems, but science cannot resolve them. The choice of solutions is ours to make, either individually or collectively in the social world in which we live.

The kind of planet and global ecosystem we want is ultimately a question of values. How much species diversity should be maintained? Should size/growth rate of human population be curtailed to protect the global environment? If so, how much? How much climate change is acceptable? How much poverty? How much energy use/waste? These value choices and decisions are ultimately made in the political arena. Our values, guided through individual and institutional interactions, determine the role, scope, and actions of government to proect, conserve, utilize, or exploit our environment.

Rather than suggest that we are forever in a political stalemate due to differing values, sometimes our values do coalesce and things do get accomplished on a societal level. The result is a "political breakthrough." With such a consensus, government, resources, and societal actions work together to resolve problems. We have several examples of breakthroughs in the United States in the past 50 years. In the 1930s, individual values coalesced into the "New Deal," from which major new social programs were created. In the 1960s, the civil rights movement swept throughout American society. In the 1970s, individual values coalesced into the environmental movement, and many new environmental laws were created.

In the 1990s, vaues may be coalescing into a new global political breakthrough. Many global environmental laws and regulations are emerging to go along with the increasing global consciousness that is now taking place. Some feel we may be at a period in human social thought where leading thinkers from all cultures will join to address the ethics of the environment and development as one unifed subject and in a global perspective.

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Developing a Global Land Ethic

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Development of a Global Environmental Ethic

Education and development of a global environmental ethic appear to the keys in resolving these problems that face us and future generations. This theme has been echoed in many places. In the mid-1980s, the World Commission on the Environment and Development pointed out that

> *"...individuals in the real world will be persuaded to act in the common interest through education... education should provide comprehensive knowledge, encompassing and cutting across the social and natural sciences and the humanities, thus providing insights on the interaction between national and human resources, between development and environment...*
>
> *... Adult education, on-the-job training, television, and other less formal methods must be used to reach out to as wide a group of individuals as possible, as environmental issues and knowledge systems now change radically in the space of a lifetime.* (Our Common Futures, 1987, p. 113).

Others, such as Robert Ornstein and Paul Ehrlich, in their book *New World, New Minds*, suggest that our biological evolutionary path has not been able to keep pace with today's technological changes and that we need to develop a new way of thinking along with a new ethic. They argue that, in the past, humankind has "filtered out" of their thinking the complex problems that are now facing us on the global scale. They suggest that we need to begin to "filter in" the imperceptible but dangerous trends that now characterize the human environment, and use a variety of sensors that are available to us to discover what is occurring to planet Earth. Like a pilot flying blind through fog, they argue that we need to trust what the scientific instruments are telling us. They state we can no longer be ethnocentric in our outlook but must look at alternative scenarios and approaches in dealing with global change issues. They contend that...

> *"...everyone needs to incorporate into their thought processes the findings of a diversity of scientific disciplines that make clear that other people and other societies have their own sets of limited truths and needs, not necessarily any "better" or "worse" than our own..."* (Ornstein and Ehrlich, 1989, p. 264).

Baird Callicott, in his book In Defense of the Land Ethic, also argues that education is a vital ingredient toward development of a global environmental ethic and that the responsibility for making this happen rests within the educational community. He contends that...

> *"... although an ethic may be articulated and persuasively advocated by a single creative individual, it will remain ineffectual unless it becomes generally distributed in the population (and) an entrenched cultural institution... For a global, ecological conscience to be realized, the task is one of environmental education and it falls squarely on the shoulders of educators..."* (Callicott, 1989, p. 223).

A Global Land Ethic

Today, there is a need to develop long-term, proactive environmental programs that are holistic, interdisciplinary, and integrated with one another. We need to remember the simple message that Aldo Leopold so eloquently voiced in his classic *A Sand County Almanac* over 40 years ago...

> *"...Mankind needs to develop a land ethic that recognizes the interrelationship of our land, water, and air resources. This ethic changes the role of man from conqueror of the land-community to plain member and citizen of it..."* (Leopold, 1949)

Leopold's advice for a land ethic is now needed on a global scale. To develop an ethic or conserving, managing, and utilizing our natural resources as a way of life, we must live an ethic that considers the long-term, as well as the short-term, the biologic as well as the economic, and we must put this ethic into action. Leopold's land ethic stressed "conviction of individual responsibility for the health of the land." He stated that in order to live in harmony with the environment, we must develop an individual and community responsibility to ensure its continued health. Today, an increasing number of people are incorporating this ethic into their daily lives, and using it to influence decisions that have local, national, and international impacts.

We need to inculcate such a global ethic into our daily lives. By setting an example in our personal lives, providing practical knowledge about global issues, and teaching "informed actions" that can be put to local use, we may begin reversing the unhealthy global environmental changes that are occuring. Many books have been written on what collective and individual steps can be undertaken. Less one think that individuals cannot make a difference, one active educator has written the following:

> "... I have witnessed how environmental issues catalyze people. The environment arouses elemental feelings about the future of life on the planet... It is time to move beyond just protecting ourselves from pollution with individual solutions like buying bottled water and organic produce; we must go to the source of the problem and start there... (individual) examples serve as beacons to enlighten us, and models to prod and encourage us to 'go and do likewise.'...
>
> *"...Knowledge gives reason to act; and action, in the face of something inevitable and frightening, is empowering. Action gives hope; hope supports action... More people are prepared to think globally because of the perversity of pollution. Now is the time to 'act locally..."* (Hynes, 1990)

Others have also pointed out that it is up to all of us, as individuals, to both become self-educated and to teach others to develop an ethic and responsibility for the world in which we live.

> *"... The future belongs to those who give the next generation reason to hope..."*
> -Teilhard de Chardin

> *"... Each of us must accept total responsibility for the earth's survival. We are the curators of life on earth, standing at the crossroads of time..."*
> -Helen Caldicott

"... *All things are possible once enough human beings realize that the whole of the human future is at stake....*"

-Norman Cousins

"... *A human being is part of the whole, called by us 'Universe,' a part limited in time and space. He experiences himself, his thoughts and feelings as something separated from the rest — a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty...*"

-Albert Einstein

Einstein once reflected that it would take just two percent of the world's population to make the changes necessary to create real peace and security between nations. Einstein's call for a new level of thinking and problem-solving to world peace can readily be transfered to the global environmental issues now facing us. Heeding the educational challenge, a small number of individuals can enlighten and educate the general public and decision-makers about these issues.

There is an opportunity to develop educational programs and activities that are interdisciplinary, coordinated, and international in scope. These programs will need to cut across economic, social, political, geographic, and environmental boundaries, and will need to call for governmental action and local responsibility. The slogan "think globally, act locally" will need to be taken to heart, and become part of our daily lifestyle. The question we must all ask ourselves is whether or not we are ready to accept the challenge.

RECYCLE
We ♡ the EARTH

An Altering of Perspective

After more than 15 years of struggling with the term, "environmental education," I have finally made a decision. I won't use it any more. It's okay with me if you do. I just want you to know that I won't.

Actually, you have nver heard me use it much. Instead, you've heard my cumbersome, "education about the environment," or other such awkward phrases.

The word "environmental" tends to polarize people — or at least, too often, gets a negative, kneejerk response that closes doors to communication. So, feeling embarrassed that it has taken so long to see something so simple, this is it: **It's environment education.**

Just as there is science education, math education, art and music education — I am a proponent of environment education.

According to *Webster's New World Dictionary*, **environment** is "all the conditions, circumstances and influences surrounding and affecting the development of an organism or group of organisms." The word invites us to consider — from a variety of perspectives — all the characteristics of settings that support life. It is an inherently balanced word.

In contrast, **environmental** is a politicized word that is typically used in an activist orientation. Many people respond to the word by asking for alternatives to the environmentalists' perspective in order to achieve a balanced presentation concerning a topic of concern. The word "environmental" is fine for some purposes, but is limited in its usefulness as a way to describe a process of education.

Activism is a process of advocacy. It is directed to achieving an end consistent with a point of view about a particular cause. I applaud the valuable and courageous contributions of activists in many settings — but activism and education are not the same. Environmental and environment are not the same.

By definition, environment education is a process that is larger than one point of view. It is a process designed to enable learners to acquire awareness, knowledge, skills and commitment to result in informed decisions and responsible behavior affecting the quality of the environment. One important way that learners deviop an informed perspective is by having access to a range of views, particularly on value-sensitive topics.

So next time you hear me say, "environment education," don't think it sounds strange or that I've left off part of the word. Recognize that I am making a conscious choice. I am supporting a process of education for whole learners on a whole planet — environment education.

-Cheryl Charles
Director, Project WILD

(reprinted from Habitrends, the newsletter for Project WILD)

THE GREEN PAGES:

ENVIRONMENTAL EDUCATION ACTIVITIES K-12

Illustrations by Sue Ann Walker

The activities in the Green Pages are intended to give you ideas to build on in your classroom. They have been kept simple to allow you to adapt them for your particular classroom needs. They have been divided by class level and subject matter to enable you to more easily integrate them into your existing schedule.

GRADES K-3

I have this feeling that one of us is in the wrong category
ANIMAL CLASSIFICATION

Science

Animal Classification

Children at any school level can learn to develop a classification system that will be meaningful to them. One simple system can be based on size alone. After choosing an animal that is a "typical" size for each of three categories, the pupils can decide into which group each animal best fits. (AZ)

A Recycling Jar

Students will be able to see how long it takes for certain materials to decompose. Fill a fish bowl or other glass container with soil found on the school grounds, a vacant lot, or a garden. Have the class choose about 5 or 6 objects to put into the jar to recycle. Choose natural and human-made objects such as leaves, sticks, cut-up apple, cigarette butts, candy wrapper or something plastic. Put these into the jar and lightly cover with soil. Sprinkle a bit of water on, cover and let it be. Put it on the windowsill. Have your students keep a record of the progress the decomposition takes. You may want to add an earthworm to the jar and watch its trails, burrows, and casting as well. However, if you add earthworms, be sure to keep the jar in a cool place, no higher than 70° F. (LLC)

Seed Hunt

Children go out and look for different kinds of seeds. When they come back, the seeds can be put in like piles. This can be followed by a discussion of the various ways that seeds are dispersed (carried by wind, on animals, in animals, droppings, floating, rolling, exploding, parachuting). Also discuss why seeds need to be dispersed, and why such a small percentage of them become adults. (JOD)

I'd like to trade this cow for a bag of beanstalk seeds
O.K. JACK here ya go
SEED HUNT

Mathematics

Simple Measurement

Simple measurement of objects and data in the outdoors can be taken at your school in many ways. This might include weather statistics, distance, weight, length, height, and width. (JOD)

Social Studies

Career Notebook

Make a "Careers Notebook" of environmentally related careers. You can start with a fisherman, mechanic, newspaper woman, and a fish and game officer. Keep going from there.

Language Arts

Pictures/Slides Showing Change

Prepare a sequence of pictures or slides that show progressive changes in nature: tides, progressing sunset, seasonal vegetation (green to brown), decomposing logs, or the coming of spring. Or, have students bring in pictures showing change. (JOD)

Fine Arts

Coloring with Natural Materials

Simple drawings can be done with minerals, plant parts, and charcoal. Try a variation (e.g., pictographs on rocks, dyeing old shirts).

Leaf Prints

Have students gather

leaves of varying sizes and textures.can make stationery or greeting cards by using ink pads, carbon paper, spatter prints, or smoke prints.

GRADES 4-6

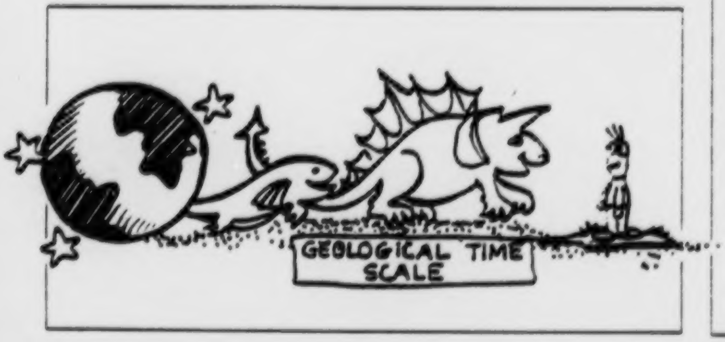
Science

Geological Time Scale

The time that human beings have lived on earth is only a tiny fraction of the total history of the earth's existence. Illustrate this by dramatically presenting this scale:

Total age of the earth (4.5 billion yrs)

January 1: *oldest rocks formed*
mid-March: *first life*
May: *first life on land*
late November: *deposition of coal beds*
December 4: rule of dinosaurs
December 26: first human-like creatures
December 31 (evening):
end of Pleistocene (ice age)
December 31 (11:58:45)
end of Roman Empire (Christ)
December 31 (11:59:45):
Columbus discovers America
December 31 (11:59:57):
Declaration of Independence



Discussion could focus on the profound impact that humans have had on the earth. Are we going to be just a blink of the eye in the history of the earth? What are our responsibilities toward protecting our environment? (JOD)

Operation: Water

Invite the participants to imagine that they have landed on Earth from another planet. The planet they come from only has minerals and air. They had received word that a substance had been found on a green planet (Earth) that could move or hold its shape. They are here to see if the report is true and discover for themselves what this "water" is like. They are equipped with finely tuned instruments for sound, feel, sight, smell, and taste. They are to split into two search parties, one going to the pond area, one to the stream. They have 15 minutes to gather sounds, smells, signs of animal and plant life, observe water clarity, composition of the bottom and materials on top, feel mud around the water and on the bottom, and bring back a sample of water in a pill bottle. The groups then discuss and compare the two water sightings and make speculations about the role of water on this green planet.

Social Studies

World Land Conference

This is an exciting activity and an outstanding learning experience, but necessitates at least one adult per six children, and some preparation. Each adult participant ("special guest") is dressed up (and acts) like someone from another place or period of time (e.g., person from Atlantis, caveman, "Lunar" from the moon, Martian, sixteenth-century Indian, seventeenth-century pio-

Response to Green Pages Activities

We recently received a letter from the Progressive Animal Welfare Society (PAWS) which addressed some concerns that they had over three activities that appeared in the Green Pages of Clearing during the past year. We felt that it would be valuable for readers of Clearing to read their comments in order to become better informed about the concerns of Humane Educators. We have printed the original activities as they appeared in the Green Pages, followed by the response by Lisa Van Horn of PAWS and Terri Spencer of The Evergreen State College.

Activity: The Cat's Meow

from Clearing issue #67
January/February 1991

Bring a kitten into the classroom. Make sure the children know how to treat an animal properly. Have the students observe the kitten as it eats, drinks, and plays. Note the roughness of the tongue. How are claws used? What adaptations allow a cat to survive in its world? What about wild cats?

PAWS Response:

"Kittens can be acquired outside of almost any grocery store during the spring and summer, their owners desperate to find homes for them. Kittens die by the hundreds of thousands in our nation's animal shelters because there are simply not enough homes available. Only one in 10 kittens born will find a home, and only 30% of those homes will keep the animal for more than 1 year. The majority will be given away, abandoned or turned into animal shelters. Pretty sobering statistics. By not addressing where the kitten in the exercise comes from or what becomes of it after the lesson is over, this attitude of companion animals as throwaway objects for our selfish uses may be perpetuated. We would suggest this activity be eliminated or modified to address the personal well-being of the cat involved. Possible alternatives include having students observe their own or a neighbor's cat's behavior or viewing a video such as those recently produced by *National Geographic* or *Nature* on the behavior and physiology of cats."

neer). The adults confront the children and ask numerous questions about this "strange environment" (that children take for granted): "What are your needs?" "What are these things with green, waving around [trees]?" "What do you value?" Many other questions can be asked. This helps children to explain details about their planet and society in a way that is fun. Plan on two hours including motivation, and a group summary as a conclusion. (JOD)

KNOTHOLE
PROSE

Wood Products and Occupations

Discuss with students what their parents do. How many are connected in some way with the forest products industry? Walk around the neighborhood and observe what the houses are built of. Have them list everything in the classroom that is made of wood. Make a large mural showing products made from wood, or make a collection of different kinds of wood. Read in class accounts of medicines such as quinine that are derived from trees. (EEnc)

Language Arts

Knothole Prose

Have students go outdoors. Have them make a "knothole" by placing their forefinger and thumb together. Students extend their arm and look through the knothole. Have them write about what they see in the most detail possible. It is easy to write several hundred words about what they see. (AZ)

Out of Place

Prepare an area whose size depends on the number of students in your group. Put natural objects in places where they don't belong, (e.g., a pine cone on a deciduous tree, a pencil laying on a branch, a flower taped to a tree trunk, a sycamore leaf taped to an oak tree branch). Send the students out into the area and have them count the number of things they can find that don't belong. After a few minutes to search, bring them back and compare their number with the correct amount. The students will quickly want to return to find the remaining objects. Clues can be given to help students find especially well-hidden objects.

Fine Arts

Seasons in the Sun

Have students make a display or posters showing how your environment changes at various times of the year. Show what changes occur in Spring, Summer, Fall or Winter. Magazines are good sources of pictures. (AZ)

LET ME SEE... I NEED FOOD, AIR WATER AND NINTENDO FOR SURVIVAL..
WORLD LAND CONFERENCE

GRADES 7-9

Science

Nature's Daily Mystery

Each day (or week) a different natural history item, picture or statement can be placed on the classroom bulletin board. Alongside is a ballot box with slips of paper for answers and student's name. The student views the mystery item and tries to determine what it is. He then writes his name and the answer on a slip and puts it in the ballot box. Each day, or week, the item is changed and those students correctly

Activity: Capture a Web
from Clearing #67
January/February 1991

Locate a spider web which is out in the open and can be approached from both sides; the corner of a roof or between branches of a tree are good places to look. Spray the web with white spray paint so that it is completely covered. Make sure you don't kill the spider by painting it, too! Before the paint dries carefully press the paper into the web and on through the web. The paint will cause the spider web to stick to the paper; practice will allow you to do this without destroying the web.

Discussion of the uses of spider webs can follow.

PAWS Response:

"Spraying a spider's web with paint brings several questions to our minds. What environmental effects will the paint have on the ecosystem being studied? Certainly not beneficial. Even if not harmful on this small scale, the message given to students seems detrimental in light of the awareness we are attempting to raise as to the effects of environmental pollutants. Although the spider may not be directly harmed, it certainly will have to build another web in another appropriate location, expending valuable energy that is critical to its survival. How about looking for spider's webs on dewy mornings, when they are naturally highlighted to show all their details? This may require that we work with nature at her own pace, instead of having the instant gratification obtained by our ability to manipulate the environment to suit our needs. But isn't that a valuable lesson in itself?"

identifying the object are given points or stars on a chart. At the end of the month or semester, winners are determined. Objects can be items such as: a feather, a fish scale, a piece of fur, a tooth, an animal dropping, a piece of wood with beaver tooth marks on it, etc. Pictures could include: part of an animal, animal tracks, a picture of a fish with only the fins and tail showing, etc. A written statement could be something like: "I am small and grey; I live in the rocks; I eat nuts, fruits, berries, and seeds; I have four legs and a long, bushy tail." (A rock squirrel.) (AZ)

Swamp Walk

If you have a wetland bog or marsh near your school, explore the area and learn about its inhabitants and its characteristics. One exciting and memorable way to do this is to have your students actually walk into the marsh and view it close up.

Have your students dress in old clothes for this activity. Or you could supply them with large garbage bags to wear as they walk through the water, depending on the depth of the marsh.

Once the students begin walking through the marsh, have them observe the smells, sounds, and sights of the wetland. Water samples could be taken for analysis back in the classroom. Creative writing assignments could be developed based on their experiences in the swamp.

Mathematics

How Long Can You Tread Water?

Project the effect that an increasing worldwide life expectancy of 10 years would have on a stabilized population level if population mechanisms were to remain static.

SIMPLE MEASUREMENT

Social Studies

The Last Straw

(A simulation game about an urban problem) — A drive-in restaurant is situated near an elementary school, a church, and a residential area. Neighbors, the clergyman, and the school principal have complained about noise and litter. The city council will have a hearing. Characters (use ficticious names): drive-in owner, teenage employees, retired woman who often works in her garden, elderly couple, lawyer, housewife, school principal, school teacher, local businessperson, mayor and city council, members of the community (remainder of class). Prepare the hearing by describing the situation. Use a ficticious map of the neighborhood, or perhaps your own. This game, or one like it, can be adapted to your community. (JOD)

Language Arts

Speaking of Soil

Have the students collect decayed and nonliving things and mount them on cardboard in the form of a collage. Have them write a cinquain about the collection. A cinquain is an unrhymed poem of five lines, with the first line having two syllables (giving the title), the second line having four (a description), the third line with six (action), fourth line eight (expression of feeling), and fifth line two syllables (another word for the title). For example:

The soil
Is rich and brown.
Decomposing for change.
It gives home and food. In short, it
Gives life.

Enough for Everyone?

The scenario: It is the year 2001. The world population is now seven billion people. The world has become too crowded, too many people are going hungry, and our fossil fuels are almost gone. The government has decided to try colonizing a new planet in our galaxy. You have been chosen to go. Spaceships are now boarding... Write a story about the new colony. Explain who you are and why you were chosen to go. Who went with you and why? What resources did you bring and how did you decide what you would need? (LLC)

Fine Arts

The Art of Stress

Use an art form to depict leisure-time activities which contribute to environmental stresses.

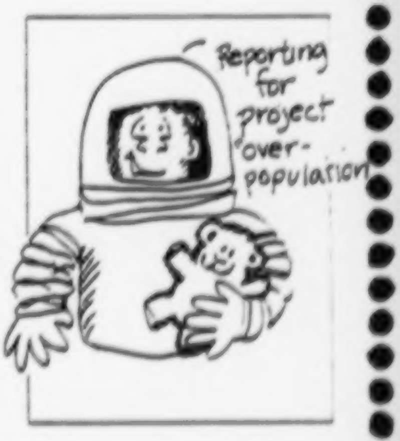
GRADES 10-12

Science

The Heat is On

If a nuclear power plant were to dispose of its heat wastes into the Columbia River so as to raise the average temperature of the river 5° F, what kinds of aquatic life would be affected and how?

Construct a model of a modified food chain showing the interrelationship that would be altered. (EME)



Social Studies

You Make the Call

Students are asked to pretend they are Secretary of the Interior, with the responsibility of deciding where a pipeline should run from a port city (like Seattle) to an interior town (like Yakima). What route should the pipe follow? Have the student defend their decision. Other students can comment on the choice and discuss alternatives.

You mean...
No electricity
???
OUT OF ENERGY

My Little Town

Using a map of your neighborhood, discuss what conservation practices on this area would benefit wildlife, water quality, or humans. Make an overlay of your map plotting improvements. Evaluate each improvement. What species of animals would benefit? Would benefits to humans be harmful to wildlife or water quality? Would benefits to wildlife and water quality to detrimental to humans? (AZ)

Language Arts

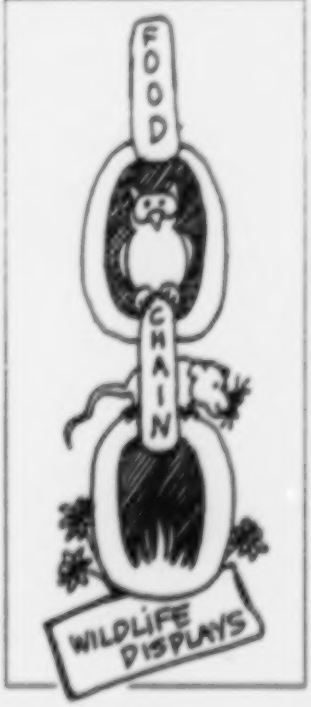
Out of Energy

Ask students to imagine that all of our fossil fuels have been depleted and that every product requiring energy is no longer useable. Imagine that the power has been shut off and try to describe how they can meet their basic needs. Have them write a descriptive story depicting a typical day in their lives as they go back to the basics. Have them share their stories with one another. How were their needs met? What were the most basic needs? What frills could we cut back on in our present lifestyles and what can we learn from previous eras to help us reach a balance with our environment? (LLC)

Fine Arts

Wildlife Displays

Prepare bulletin board displays for National Wildlife Week or for other events. Make displays show: value of wildlife in your state, aesthetic values of wildlife, relationships of wildlife to each other (mouse-owl-grass) and to the environment. Have each display make a statement regarding the ecology of the particular species.



SOURCES:

AZ - Arizona Department of Wildlife Conservation Education Materials
LLC - Living Lightly in the City (Schlitz Audubon Society)
JOD - Just Open the Door
EME - Energy and Man's Environment
EEnc - Environmental Encounters

Activity: Fish in a Lather

from Clearing #66
November/December 1990

Place a goldfish in a small aquarium or other suitable container. Add a few drops of liquid detergent and observe the fish become listless and gulp for air. Return the goldfish to clean water or the regular aquarium from where he may have been taken.

Discuss with the children what seems to happen to fish if we put detergent in the water.

Do we put much detergent into our sewage system, streams, rivers or lakes?

Ask children to find out why their parents use detergents rather than soap.

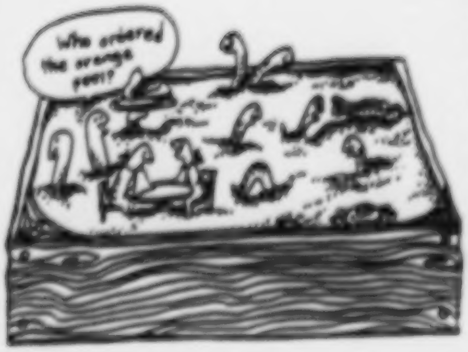
Is it necessary or good to try to get clothes "whiter than white," as they tell us to do on TV? Why or why not?

PAWS Response:

"This activity affected us the most on a personal scale. Encouraging young children to not only observe but actively inflict the suffering of a helpless animal is very inappropriate to any educational setting, and particularly with the field of environmental education. This activity does not in any way encourage respect for living creatures and promotes the viewing of animals as tools for human ends. There is considerable evidence to support the theory that childhood cruelty to animals can be used as a predictor of later adult aggression and violent behavior. We would be happy to provide these references upon request. The incidences of violent acts, both against each other and against nature, continue to rise in our society and we have a responsibility as educators to do our part to break this cycle. Activities such as the fish experiment are small but significant ways in which we may fail to this responsibility."

The editors of Clearing acknowledge the need to be more sensitive to animal welfare in the development and printing of classroom activities. We will do our best in the future to avoid activities that show disregard for the safety and welfare of animals. We thank Lisa Van Horn, Terri Spencer and the Progressive Animal Welfare Society for writing us with their concerns.

For more information on the Progressive Animal Welfare Society and their work, contact them at the Humane Education and Animal Care Center, P.O. Box 1037, Lynnwood, WA 98046; (206) 742-4142.


Who ordered the orange peel?

Recycling/Solid Waste

Worm Bins: Portable Ecosystems

by Mary Knackstedt
Pierce County Solid Waste Division

Worm bins are wonderful educational tools. As an educator for the Pierce County Solid Waste Division, when I am invited into K-12 classrooms to talk to students about waste issues, I always bring a worm bin. The worms usually turn into the star attraction and sometimes after my visit, students become motivated to build and stock a worm bin for their classroom.

I also bring a big bag of trash to share. As we sort through the garbage, young people are full of suggestions on ways to prevent the resources in the bag from going to the landfill. They understand recycling as it is controlled by humans with materials like metals, paper and glass. But when confronted with an orange peel, they are often stumped. They know that food scraps spoil, but children often do not associate this process with recycling. They do not realize that when organic material rots it is being utilized by organisms as a source of food and that these activities drive the recycling of nutrients on Earth.

I use a worm bin to introduce students to a different view of waste and recycling. The simple little box is useful for placing these concepts within a global perspective. When students see how quickly food scraps are consumed in the box, they become aware that waste is a misnomer — our wastes are resources to organisms whose "waste" products are indispensible to the health of our planet. They become aware that humans did not invent recycling, but that we pattern our behavior after a process as ancient as life itself.

A worm bin allows youngsters the chance to observe a community or organisms that thrive on and recycle organic wastes. Red worms are the primary, but not sole inhabitants of a worm box. They are readily domesticated as long as conditions are maintained to suite their needs. As soon as the box is opened, the worms flee from the light, a natural survival response of a creature whose entire body surface acts as a moist membrane for gas exchange. Worms shun sunlight to avoid drying out and suffocating. As we dig deeper into the bedding of shredded paper, masses of red worms are revealedfeeding on egg shells and coffee grounds. A healthy, thriving box should contain several egg cocoons that look like tiny lemons. Cocoons are leathery bags that protect the fertilized eggs which hatch in about three weeks to produce an average of four worms each. Some students (and teachers) approach the box with their noses plugged, expecting disgusting smells and are relieved to find that a well-tended box does not reek; but has an earthy odor.

Quite often, an observant student will ask "What's that black stuff?" When their question is countered with "What do you think it is?", the most common answer given is that it is soil. Most students assume that I put it in the box. I deny all responsibility and watch their eyes widen as they figure out the nature of the substance. They learn that gardeners value worm castings because they are a high quality compost for plants. Sometimes seeds from fruit and vegetable wastes can be observed to germinate and struggle to live in the rich but sunless environment of the box. Eventually, the reserves of stored sunlight contained in the seeds are extinguished and assimilated into the "black gold."

Worms are the most populous of the large organisms in the box, but other inhabitants can be observed with the naked eye too. A family of woodlice live in the dark corners. Young people, for some reason, feel kindly towards these familiar creatures. They are surprised to learn that they are not insects at all, but are actually a type of crustacean. This is an order that consists primarily of marine forms such as crabs, barnacles and sand fleas. They have been able to evolve away from their watery origins because they live in damp, dark environments like worm boxes. They peer closely at the animals when told that the females carry their young in a brood pouch like a kangaroo. Tiny springtails bounce around on the bottom of the box. These ancient insects have sensory organs that people don't understand very well. A bristle on their bodies is conjectured to measure humidity, so that they, too, can detect and keep to damp places. Nematodes, mites, spiders, a couple of small slugs, some fungi, and ravenous hordes of micro-organisms are co-inhabitants that emerge and are reabsorbed into the ferment with the dark, warm environment.

I don't interfere with most of the creatures that take up residence. In fact, I encourage their presence by inoculating the box with leaf litter occasionally. I would not presume to think that I could control, or truly understand, the balance of interactions that exist in this mini-community. Even an occasional centipede is tolerated — in spite of their appetite for worms. Glimpses of these sinuous predators as they streak around hunting for prey lends drama to the box as they illustrate the apex of the food web. They and the spiders reign at the top of the heap as the consumers of the community.

Students' curiosity about the bit of nature enclosed in my one cubic foot portable ecosystem never fails to charm me. Studying this box allows folks who are quite removed from nature to get a peek into the fundamental processes that reshuffle waste molecules into reusable nutrients. Students' reactions run the gamut from fascination to horror as they observe rot in action. Rarely are they indifferent. As a visiting teacher, I can only give a brief lesson on the ecology of the box. Ideally, students would have one of their own to handle classroom food wastes. As members of an affluent society, we often have negative or unrealistic attitudes about waste — we throw or flush it away and do not realize its role in the cycles that sustain life. It is good for children to use their scraps to support a host of

BEST COPY AVAILABLE

organisms and realize that the resulting product improves soil and nourishes plants which they, in turn, could havest to eat. Keeping a worm box and a few plants in the classroom is a way for students to be participants and stewards of an interacting web of consumers, decomposers and producers.

A worm box is fairly simple to build and maintain. Secondary students in wood shop classes could easily assemble boxes for use in their own school or for elementary schools in the district. The construction plans included in this article build a box with about 7 cubic-foot capacity. This size is big enough to handle snack wastes and some lunch wastes for a typical elementary classroom. A general formula for stocking worm bins is that for every cubic foot of bin you need:

- **About 500 redworms** (*Eisenia foetida*). 1 lb. consists of about 1000 worms. If you have less, don't worry about it, treat your worms well and they will multiply. Redworms are often found in manure or leaf piles. Commercial sources of redworms may be identified by looking in gardening catalogs or by calling your state's recycling hotline for local suppliers.

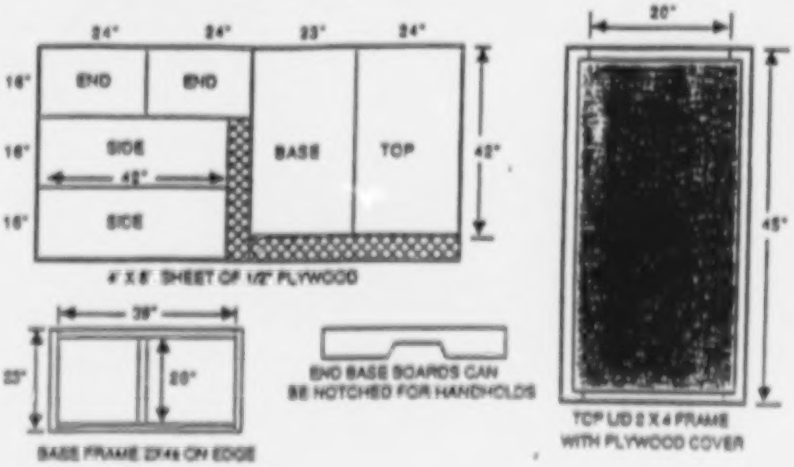
- **Bedding to a depth of 1 foot or less.** Shredded paper, peat moss or leaves can be used. Dry bedding should be moistened with water with a 1:3 ratio of bedding to water.

- **Garbage.** Avoid meat scraps, bones, and fatty foods. Don't overfeed the worms or the box will become a smelly mess. Worms in optimum conditions can consume their weight in food daily.

- **A handful of soil.** To seed your box with organisms that help break down wastes.

- **Calcium source.** Add some egg shells or pulverized sea shells occasionally.

Every 3 to 6 months the bin should be cleaned out. This can be accomplished by moving all the compost to one side and placing new bedding in the vacant half. Bury all food wastes in the new bedding and the worms will migrate into that area. Compost can then be harvested and replaced with the new bedding. The book, *Worms Eat My Garbage* by Mary Appelhof is an excellent and entertaining guide to keeping a worm box.


24"
24"
23"
24"
16"
END
END
16"
SIDE
42"
BASE
TOP
42"
16"
SIDE
4' X 8' SHEET OF 1/2" PLYWOOD
39"
23"
20"
BASE FRAME 2X4s ON EDGE
END BASE BOARDS CAN BE NOTCHED FOR HANDHOLDS
20"
45"
TOP LID 2 X 4 FRAME WITH PLYWOOD COVER

Building a Worm Bin

Materials:

1 1/2" treated sheet of plywood
1 12-foot 2x4
1 16-foot 2x4
2 lbs. 6d galvanized nails
1/2 lb. 16d galvanized nails
2 galvanized door hinges

Tools:

Tape measure
hammer
screwdriver
drill with 1/2" bit
skill or rip hand saw
saw horse
long straightedge or chalk snap line
safety glasses and ear protection

Construction details:

Measure and cut plywood as indicated in the drawing. Cut the 12 ft. 2x4 into five pieces: two 39", two 23", and one 20" long. Nail the 2x4s together on edge with two 16d nails at each joint as illustrated in the Base Frame diagram. Nail the plywood base piece on to the 2x4 frame.

Cut four 1 ft. lengths out of the 16 ft. 2x4. Take each plywood side piece and place a 1 ft. 2x4 under each of their ends so that the 2x4 is flush with the top and side edges of the plywood, and nail the boards into place. Nail the side pieces onto the base frame. To complete the box, nail the ends onto the base and sides. Reinforce the box by staggering a nail every 3 inches wherever plywood and 2x4s meet. Drill twelve 1/2" holes through the bottom of the box for drainage.

To build the lid, take the remaining 12 ft. 2x4 and cut it into two 45" pieces and two 20" pices. Lay them flat with the short pieces on the inside as indicated in the diagram, so that the plywood top is inset from the edges of the 2x4 by 1.5" all the way around its perimeter. Nail the plywood onto the 2x4 securely. Place the hinges on the back side of the box at both ends of the 2x4's, and on the underside of the 2x4 lid frame, so that the lid will stand upright when opened.

Pierce County wishes to thank the Seattle Solid Waste Utility and Seattle Tilth Association for permission to use these plans in our compost education program.

CLEARING
the resource and activity guide for environmental education

Meeting the Mandate:

Integrating Environmental Education

The second in a series of articles addressing the recently passed mandate to teach environmental education in K-12 schools in the state of Washington.

How to Fit Environmental Education Into an Already Full Curriculum

Martha C. Monroe
University of Wisconsin-Stevens Point

The critical importance of environmental education — of helping young people develop the knowledge, skills, attitudes, motivation, and commitment to help resolve environmental issues — has been of special concern to educators. Just how environmental education should be implemented, however, is debated around the world. Adding anything more to an already overburdened curriculum is out of the question. Expecting every teacher to become an expert on environmental issues is unrealistic. Using the environment to illustrate and teach the existing curriculum objectives, through examples, field trips, or current events, is possible. This is infusion.

As with other disciplines in education, two broad components require attention when infusing environmental education into the curriculum. The most obvious is content. A chemistry teacher can introduce the toxic effects of the element mercury, explain how it can be taken up by plants and animals, and describe its effects on fish in Wisconsin, dancing cats in Japan, or mad hatters in Europe. An elementary teacher could use an outdoor area as a source of words for the vocabulary list, and encourage children to write poetry from outdoor inspirations. A unit on Africa can be more exciting with a day spent on African animals and the food web that ties them together in their environment. The effect of population which grows larger than the environment's carrying capacity could interest a biology class in exploring lemmings, mules in the Grand Canyon, deer in Wisconsin, or the human population. When learning public speaking skills, students might choose to research and deliver a speech on a local environmental issue — development, solid waste, groundwater pollution, etc. A lesson on government, legislation, and citizen efforts could highlight the endangered species act or local wildlife management regulations. The possibilities are as varied as your imagination, because the environment crosses discipline boundaries and is an appropriate forum for social studies, language arts, fine arts, health, and science classes.

But knowledge alone does not an environmentally literate person make. The process component of education is equally important: it includes opportunities for forming attitudes, developing skills, and encouraging participation in resolving issues. The process of identifying an issue of concern, of brainstorming alternative solutions, or researching and choosing the most appropriate solution, and of implementing a plan to make their idea a reality is environmental education, if the subject is lunchroom noise, bicycle rack availability, seating arrangement, or library hours. Becoming aware of how environmental issues are resolved, of the people who make a difference, and of some solutions helps students believe that these critical issues are not hopeless, and they are not helpless. Exploring various value perspectives in the classroom and the community will help students understand that issues are controversial because of different, not right or wrong ways of looking at information.

This dimension of environmental education (attitudes, values, and skills) separates it from environmental science. Most current texts in science or social studies include units on environmental issues — it is expected that teachers will teach concepts about groundwater in earth science, food chains in elementary science, and diverse opinions on current issues such as nuclear power in social studies. An environmental educator would help students understand the controversial issues, attitudes, and skills associated with these topics.

For example, rather than teaching food chains as a fact of life, an environmental educator might help students understand the consequences of a toxic link in the chain, the avenues for solutions, and the conflicting values that are involved. The process of biomagnification concentrated DDT and other deadly pesticides in the aquatic food chain, affecting the reproductive system of predator species like the bald eagle, cormorant, brown pelican and osprey. Whose fault? Whose responsibility? Who pays? Everyone. The joint efforts of wildlife researchers, wildlife managers, legislators, chemical manufacturers, toxic chemical regulators, and citizens were needed to ban the worst offending chemicals and to preserve critical habitat from other affronts in order to increase the bird populations.

An environmental educator also helps students practice the communication, decision making, and citizenship skills that might be involved in the resolution of these issues, and would encourage discussions about the lifestyle changes that every citizen should consider in order to protect our environment.

In short, there are four kinds of activities which help convert environmental facts to environmental education. Different subject areas and different grade levels will utilize these methods more effectively than others:

1. Extend the facts to include the issues — the often controversial edge between people and the environment — and examples of solutions to these issues.

2. Practice problem solving skills with students: communications, group skills, leadership, creative thinking, and decision making are a few.

3. Explore appropriate environmental feelings, attitudes, and values. Students can gain an appreciation and sense of responsibility for others and the environment, and ultimately compare their values to their lifestyle and actions.

4. Involve students in the resolutions of real issues.

The Governor's Council for Environmental Education

The Washington Governor's Council on Environmental Education, chaired by Curt Smitch, director of the Department of Wildlife, was established in 1990 to raise the visibility of environmental education, provide a forum for coordinating environmental education efforts for all citizens.

Curt Smitch has been director of the Department of Wildlife since 1988. A one-time science teacher in Renton, WA, Smitch has an M.A. in general science education from Western Washington University and a Ph.D. in education from Michigan State. He was director of the Hawaii Center for Environmental Education.

WHO IS THE COUNCIL?

All the natural resource agencies: Agriculture, Ecology, Fisheries, Health, Natural Resources, Wildlife, Interagency Committee for Outdoor Recreation, Parks and Recreation Commission, Puget Sound Water Quality Authority, State Energy Office, plus the Superintendent of Public Instruction and WSU Cooperative Extension. All of these agencies have been offering environmental education, many through the schools and to civic groups. What works best, how to broaden our reach, how to teach more effectively, all are mentioned by council members as issues to be considered.

Significantly, the State Board of Education passed Washington Administrative Code 180-50-115, requiring an interdisciplinary environmental education program in the K-12 system.

HAS THIS EFFORT WORKED ELSEWHERE?

Washington is breaking new ground. Environmental education has been going on, at a significant level since the 1970s. But much of it has been fragmented. Now Wisconsin has adopted environmental education as a principle. And the Environmental Protection Agency has a new program and grant monies for innovative demonstration projects. But Washington may be the first to try to blend a multitude of efforts, to make the sum greater than the whole.

ARE THERE EXAMPLES OF ENVIRONMENTAL EDUCATION ALREADY WORKING WELL?

Infusing EE Into the Curriculum

A Planning Guide to Help You Meet the Washington State Mandate for Environmental Education

Environmental education should permeate the entire curriculum with every subject area at every grade level dealing with the environment in some way. Some subject areas, by their very nature, present greater opportunities for the infusion of environmental education, but all have a role to play.

Suggestions regarding potential subject area roles follow.

The Governor's Council on Environmental Education

(continued)

There are some outstanding ones. In the North Mason School District, in Belfair, a gift of 75 acres along Hood Canal has been turned into a wetlands education project. The Department of Wildlife added another 60 acres to the project. The school system and the community had a master plan developed, obtained public funding from several state sources, and there is now a center for education and community events. Trails and educational displays take people through uplands, meadows, swamps, fresh and tidal marshes. A community center building provides space for Belfair activities, and an additional building with a classroom is planned.

There are many other excellent projects developed by teachers, curriculum designers, public agencies, private foundations and others, and many of them need to be made available to broader audiences or more classrooms. We have to stop thinking of environmental education in isolation from other topics.

Some of the efforts have been substantial, and accomplished with minimal resources. The Office of Environmental Education in SPI provides a variety of materials and workshops, as do others.

Some of the ideas with the most potential are just being developed now.

WHAT KIND OF RESOURCES WILL THE COUNCIL HAVE?

The combined efforts of member agencies make a formidable group.

DATA ON BEVERLY ISENSON, SPECIAL ASSISTANT TO THE GOVERNOR'S COUNCIL ON ENVIRONMENTAL EDUCATION

Beverly Isenson is the Council's new special assistant. She has substantial experience working with diverse groups to define and develop public policies. She has a B.A. in political science from UCLA and has worked on educational media projects, community redevelopment projects and with resource development and environmental protection organizations. Isenson is an honorary lifetime members of the American Institute of Architects, Alaska chapter, for her writing on architecture and planning.

Agriculture

Agriculture education provides an excellent opportunity to teach about a number of very serious environmental issues and problems, including groundwater contamination from agricultural chemicals, accelerated soil erosion, threatened and endangered plant and wildlife species, energy shortages, and soil and water conservation. Many opportunities are available for students to have direct experiences in dealing with these problems.

Art

Art education curriculum guides have emphasized the role of art in developing an aesthetic awareness and sensitivity to both natural and built environments. Art programs should incorporate elements of both natural and built environments into learning experiences offered to students. Both aesthetic elements and the role of art as a means of communicating environmental messages to others should be included.

Foreign Language

Programs in foreign language provide an excellent opportunity to develop a global orientation to studies about the environment. When dealing with the native country and the culture of its people, the class can also examine how the country's inhabitants feel about and deal with environmental issues. This is particularly true at advanced levels when current publications in a country's language might be used as source material. Examples of current environmental issues in other countries which might be used are the French position on nuclear energy and the damaged to German forests attributed to acid rain.

Health Education

Health education is none of the most important subject areas in which to deal with various aspects of the environment. Both physical and mental health are dependent upon high quality natural and built environments. Such topics as hazardous chemicals in the home and the workplace, air and water pollution, the

BEST COPY AVAILABLE

need for healthy recreation activities in both indoor and outdoor settings, and the relationship between noise and health are important to consider when planning a health education curriculum. Aspects of environmental health should be included at the elementary and middle school levels of the health education curriculum as well.

Home Economics

The home economics curriculum affords an opportunity to examine such environmental problems and issues as energy use and conservation, excess packaging and solid waste disposal, recycling, chemical food additives, hazardous chemicals in the home, and other lifestyle related topics. As with other programs which are offered primarily in middle and senior high schools, home economics programs could make a major contribution to the achievement of skill and participation objectives.

Industrial Education

Energy, its use and conservation, has become an important aspect of many programs in this subject. Other issues and problems which might be considered are metals and other materials as natural resources, the use and disposal of hazardous chemical substances, and aesthetics in the design of structures within a community or environment.

Language Arts

All aspects of the language arts have an important role to play in environmental education. Many elements of environments, natural and built, serve as excellent topics for creative writing. The kinds of environmental awareness activities recommended for very young children are excellent for assessing and developing background knowledge for reading. Dramatics activities provide a means of reinforcing environmental concepts learned through other types of experiences. Older students learning to prepare and deliver speeches might study and testify on issues at public hearings. They also might maintain journals and write reports of their findings, successes and failures. Many environmental books such as A Sand County Almanac by Aldo Leopold and Walden by Henry David Thoreau, provide examples of different writing styles. Two major K-12 environmental education curriculum programs, Project Learning Tree and Project WILD, use the language arts extensively in teaching about the environment. Both indoor and outdoor, natural and built environments are used. All of the language arts could be addressed through an environmental topic developed as a thematic unit.

Mathematics

The resolution of environmental issues often is dependent on the collection and analysis of data, and the communication of results through charts and graphs. Thus, mathematics becomes an important tool to those involved in the resolution of such issues. Many mathematics concepts can be made more understandable if experiences and examples from natural and built environments are used in teaching and learning about them. Geometric shapes and patterns of all kinds — circles, ellipses, rectangles, spheres, cylinders, cubes, and spirals — are found throughout both natural and built environments.

Physical Education

The development of lifetime skills has become an important part of the physical education curriculum in recent years. Included in this emphasis are canoeing, backpacking, camping, fishing, and other outdoor activities. Physical education programs have become a means to deal with topics like outdoor ethics, the pros and cons of hunting, consumptive versus noncomsumptive outdoor activities, and the relationship of a quality environment to physical and mental health.

Science

The study of science presents numerous opportunities to deal with environmental topics at almost any grade level. An important part of environmental education content is a major part of the sciences, but to equate environmental education and science is erroneous. The goal of environmental education is to prepare citizens capable of acting on behalf of the environment. An understanding of certain aspects of science is an important part of the qualifications for effective citizen action.

Two other components of science education are very important to environmental education programs: the emphasis on the development of problem-solving skills and the student of the relationships among science, technology, and society. Science education makes an important contribution to achieving the skill and participation objectives of environmental education.

Social Studies

The social studies have a responsibility for environmental education equal to that of the sciences. The goal of environmental education is to prepare citizens capable of acting on behalf of the environment. Since policy decisions on the local, state, national, and global levels are tied to human political and economic systems as well as the value positions held by people, it is within the realm of the social studies to describe, analyze, and study alternative actions and behaviors relative to the health of the environment.

Other Subject Areas

Subject areas not included in the preceding discussion also have roles to play. All subject areas can and should be concerned with the conservation of natural resources and contamination of the environment.

It is difficult to recommend any kind of schedule for environmental education. If a district environmental education committee develops scope and sequences, using one or more environmental education programs and matches it against existing subject area scope and sequences, the amount of infusion suggested will probably vary greatly between grade levels and subject areas. No specific time allocations will be recommended but the subject areas which should bear the major responsibility for teaching about the environment are art, language arts, health, science, and the social studies. A substantial portion of the curriculum and of instructional time in these subject areas should be identifiable as environmental education.

Environmental Education's Rendezvous with Destiny

We need to rediscover our senses if we are to live in harmony with the earth.

by Michael J. Cohen
World Peace University
Roche Harbor, Washington

The natural world, a global life community, approaches perfection. As it organizes, perpetuates and regenerates itself, it creates an optimum of life and diversity without producing garbage, war, pollution or excessive stress and violence.

The word "humanity" roots itself in "humus," a balanced life community of soil, because humanity's relationship with Earth is like our leg's relationship to our body. With the exception of our destructive cultural tendencies, we are each a seamless continuum of Nature's wisely balanced relationships. Gregory Bateson identified our greatest challenge. He noted: "Our social and environmental problems result from the difference between how Nature works and the way people think."

For anyone to think like Nature works, they must trust their experiences. Too often we learn to trust our interpretations or words describing an experience rather than the experience itself. For example, our words tell us we experience and learn from five senses: touch, taste, smell, sight and hearing. However, at birth we inherit not five, but over 53 pervasive senses and feelings of, by and from Nature. But, don't believe me. Trust your experiences. Do you or don't you sense hunger? thirst? compassion? motion? By including the five senses we already acknowledge, this totals 18 senses. And if what I'm saying disturbs you, so much the better. Your disturbance is a feeling. It indicates that your sense of reason is also alive and well. That makes 19 senses we've identified. There's a minimum of 24 more including electromagnetism, direction, season, hormone and supercommunity. Being sensitive to senses is how Nature thinks. To gain Nature's balance, we must feel natural senses and trust the feelings.

Every natural sense is a fact, a vital connector arising as part of Nature's diversification. For example, an organism living in the sea has little need for being attracted to water. But, as a land animal evolves, a survival affinity like thirst must simultaneously evolve to connect the land organism to water and vice versa.

In order for the global life system, or any system, to function, each of the system's parts must connect with the system in some way. Any part or particle that doesn't make contact with a system can't be part of it, for it can't coordinate its activities with it. People are part of the global life system. We and it connect through 53 senses like thirst, sight and community. Even microorganisms and minerals sense moisture, heat, light, chemicals, gravity, electromagnetism and each other. By this means, over the eons they, not us, invented Earth's chemical, genetic and sensitivity systems including photosynthesis, fermentation, respiration, nitrogen fixation, homeostasis, antibiotics, and reproduction.

Prejudicially, our rationality denies natural senses and feelings because we're not taught to validate them. Our common culture teaches us that natural senses are invalid because:

- senses are the ways of Nature, "the enemy we must conquer to survive." Most of our "dirty" words describe natural processes. Satan gives us our problems and he is Nature, he has fur, claws, horns, and a tail. Our relationship to Nature is like hitting a pretty girl in the face with a shovel.
- senses are short term and subjective. Subjectivity is unscientific. Each of us may interpret or respond to senses somewhat differently.
- senses interfere with our dominion of the world. We don't control thirst, it controls us.
- senses are not materials. To our materialistic outlooks senses are immaterial. They are not matter, so they don't matter.

For these reasons we don't validate natural senses. Instead, we subdue them or "toilet train" them to our customs and technologies. We place more trust in a modern plastic nursing bottle full of chemicals than we do in Earth's time-tested, balanced breast of life.

Modern education neglects to

Rendezvous with Destiny

(continued from page 3)

teach that our sense of thirst is as much a part of water as is wetness. We seldom learn that life sustains itself by flowing through itself, that the global life community created thirst feelings to help keep water flowing for Earth's survival as well as our own. Our natural senses are also the living Planet expressing its need to flow. Like a shutoff valve, each sense regulates and balances. For example, thirst not only tells us to drink the Planet's water, but quenched thirst feelings tell us when to stop drinking. Demeaning senses disenfranchises us from their knowledge; they become "God things."

In concert, Nature's many senses create a global symphony as they intersect and modify each other. Scientists confirm that even our daily adult thoughts and acts originate in deeper, old brain senses and feelings which our modern upbringing buries, hiding them from consciousness. These natural senses are why children relish Nature. Children don't learn to love Bambi, they are born with that love. But when unexercised or injured, it deteriorates.

Planet Earth and our bodies operate through a congress of senses, a consensus or common sense. People like St. Francis of Asissi, Albert Schweitzer, Aldo Leopold and John Muir responded to Earth's many senses. In wilderness they, like environmental activities today, sought and found balanced wisdom as did Moses, Jesus and Gandhi.

How much better all lives might be if Earth's balancing interplay of senses helped regulate our runaway lives. Imagine the world if we experienced senses like global community, place, and nurturing as strongly as we experience thirst, hunger and respiration. Models for this exist. Strong senses balance a beaver's technological house and dam building efforts as well as its environmental relationships and number of offspring. Senses also balance people(s) that culture them. In these cultures, strong sensations make social or environmental irresponsibility feel like a criminal, irreverent act. But without balancing signals from our many senses, we become cultural objects, programmed soldiers of civilization's unchecked, destructive tendencies.

Studies show that the average American spends over 95% of his or her time indoors. Our upbringing rips us from the natural world, causing children to cry. Painfully, it severs our protective natural senses, lets them die, or re-attaches their injured, sensation-seeking raw ends to questionable technologies and practices. Our runaway emotional and substance dependencies (including substances such as money, oil, automobiles, food and trees) result from our attempts to either rejuvenate our injured sensations, or soothe our severance from pain. Addictively, abusively, we violate each other and Nature not for survival, but to obtain sensation crutches. We create our disorders as we slash our natural sense bonds with Earth and re-cement them to conflicting geographic, technologic, or ideologic boundaries. The more we have been hurt, the greater is our tendency to do this.

Our abstract way of knowing is paper thin. One inaccurate word or concept can change our destiny. Like insane zombies, we normally guide our daily lives using only four senses: sight, sound, reason and language. To experience life's fullness we crave sensation. Our great problem, greed, stems from some of our inborn senses being separated from natural balancing senses that were subdued during our upbringing. When we deprive senses and feelings, we want. When we want, there is never enough.

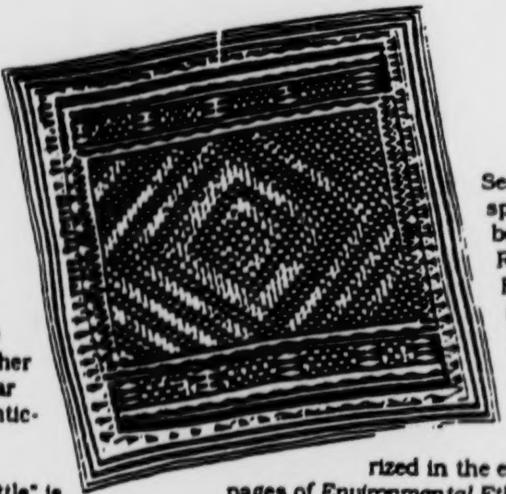
Over and over again history shows that we can't successfully live by reasoning and language alone. The polluted, violent, aspects of our society are nonsense because they are disconnected from Nature's wise, guiding congress of senses (consensus). They are insane because they are emotionally out of balance.

People(s) who respect Nature sensually bond their children to Nature's harmonic workings. They rarely suffer the destructive problems of modern life. They say they govern themselves by sensations, by "thinking with their heart." Intelligently, sensitively, feeling fully, they hold the natural world in awe and in common. This guides and unifies them. They respect other species as cherished relatives, and natural areas as sacred places. When modern people embrace Nature, they too learn to intensely feel and cooperate. They too evolve a common sense that reveres being and all beings. ☐

From the proceedings of the 1991 North American Association for Environmental Education Conference in St. Paul, Minnesota, published by NAAEE, P.O. Box 400, Troy, Ohio 45373.

Chief Seattle's Gospel: Chiefly Protestant Propaganda?

by Noel Gough



Most environmental educators will be familiar with what has become known as "Chief Seattle's speech." Many environmentalists consider it to be one of the finest statements ever made on behalf of nature — it has even been called "the Fifth Gospel" — and it has been reprinted regularly in books, journals and curriculum materials around the world. *Outlook Australia* has Chief Seattle's speech as being given in 1853, whereas *Green Politics in Australia* cites it as "a letter from Chief Seattle... to US President Franklin Pierce in 1884." A recent issue of *Green Teacher* (July-August 1991) carries an article which introduces the speech by saying that it contains prophetic statements about pollution and the environment that can be seen to be true today." *Outlook Australia* also suggests that parts of the speech "foretell the future." The speech to which they refer does not contain prophecy but hindsight. As has been revealed recently, the popular version of the speech is not a native American text but is excerpted from a movie script written in 1971-72.

I cannot resist a note of self-righteousness here, since I have never been tempted to quote from popular versions of Chief Seattle's speech. One reason for not doing so has been scholarly caution, since few reprints of the speech cite a primary source. For example, *Outlook Australia* follows the US materials from which it is adapted by citing a magazine, *The Minnesota Volunteer*, as its source whereas the citation in *Green Politics in Australia* simply states "Chief Seattle's testimony, *United Society for the Propagation of the Gospel*, London." My other reason for caution was the uneasy feeling that Chief Seattle's alleged speech seemed a little too good to be true, with some passages having the kind of trite sentimentality that characterizes John Denver's song lyrics rather than the tribal aesthetics that inform native American oracy. William Devall and Steve Van Matre correctly source their quotes from Chief Seattle's speech to the movie, *Home*, but neither of these authors appear to question the authenticity of the words they attribute to him.

Chief Sealth ("Seattle" is a Euro-American corruption) led six allied tribes in the area around Puget Sound, Washington and he really did make a speech sometime between 1853 and 1855 in connection with the signing of the Port Elliott Treaty or the negotiation that led to it. Sealth spoke Duwamish and a Dr. Henry Smith translated it into English. The accuracy of this translation is a matter of speculation, but nineteenth century folklorists are notorious for censoring and sanitizing native American narratives, many of which are bawdy tales of "bestiality, adultery, violence, thievery and assault." Smith's version of Sealth's speech has been published as "The Indian's night promises to be dark" and, while other "authentic" versions of the speech are in print, all derive from this translation. There is no evidence that Chief Sealth ever wrote a letter to President Pierce.

The story behind the popular version of Chief Seattle's speech has been told by Rudolph Kaiser (1987) and J. Baird Callicott (1989) and summarized in the editorial pages of *Environmental Ethics*. According to these scholars, the speech was written be Ted Perry, a screen writer, for the movie *Home*, which was produced by the Southern Baptist Radio and Television Commission and shown on U.S. national television in 1972. Perry used a version of Sealth's translated speech as a model, but has admitted that it was a "mistake" to use Chief Seattle's name: "In writing a fictional speech I should have used a fictional name." According to Perry, the producer left the screen writer's name off the credits because "he thought the text might seem more authentic if there were no 'written by' credit given."

The producer was right. Perry's

Another Voice...

"Our land is more valuable than your money. It will last forever. It will not even perish by the flames of fire. As long as the sun shines and the waters flow, this land will be here to give life to men and animals. We cannot sell the lives of men and animals; therefore we cannot sell this land. It was put here for us by the Great Spirit and we cannot sell it because it does not belong to us. You can count your money and burn it within the nod of a buffalo's head, but only the Great Spirit can count the grains of sand and the blades of grass of these plains. As a present to you, we will give you anything we have that you can take with you; but the land, never."

— Blackfoot Indian Chief, in response to treaty offer.
from *Touch the Earth* by T.C. McLuhan
Simon and Schuster, 1971

"Chief Seattle's Speech" has been accepted and acclaimed universally as the authentic words of a far-sighted native American proto-environmentalist. Indeed, it seems that Perry's text is assumed to be authentic by some native Americans: the popular version of Chief Seattle's speech that appears in *Green Teacher* is reprinted from a resource guide published by the Okanagan Indian Curriculum Project (ironically, the Okanagan region is only a few hundred kilometres north-east of Sealth's ancestral lands). *The Gaia Atlas of First Peoples* also quotes from Perry's text, but gives the excerpts a gloss of authenticity by attributing them to "Sealth, a Duwamish chief."

Much of the force of Perry's "Chief Seattle speech" derives from false assumptions about its author. Perry's text does not give us the voice of a native American but a heavily romanticized Euro-American version of one.

Knowing that Perry wrote the popular version of Chief Seattle's speech does not necessarily invalidate its message, but it is not Chief Sealth's message and it does not always do justice to his authentic wisdom. There are historical inaccuracies (the slaughter of the buffalo is about twenty years too early) and metaphors that owe more to mid-twentieth century pop-ecology than to Duwamish literary canons (e.g. "Man did not weave the web of life; he is merely a strand in it"). In addition to anachronistic references to air and noise pollution, some passages are almost comically derivative of the let's-all-go-hug-a-tree school of ecoconsciousness-raising.

But the sting in this tale is that significant parts of Perry's script are in direct contradiction with Chief Sealth's original speech. These contradictions reveal that Perry's text is not just a benign borrowing of Sealth's rhetoric but a form of cultural cannibalism which selectively appropriates and distorts native American values in the interests of the film's Southern Baptist producers. In Perry's version, Chief Seattle says: "Our God is the same God... He is the God of man, and his compassion is equal for the red man and the white." But in his original speech, Chief Sealth said: "Your God loves your people and hates mine... The white man's God cannot love his red children."

Perry's well-meaning words can be interpreted as the wishful thinking of a present-day Protestant who realizes that Christians need to reconceptualize their faith as the earth sickens unto death in the wake of Western "progress." But it is an intolerable blasphemy against native American spirituality to put those words into Chief Sealth's mouth. To do so is to suggest that the principles of harmony, community, relationship and balance that inform the spiritual lives of native Americans are in some way compatible with the Protestant, mercantile, individualistic ethos which shaped the USA as we now know it. It was this ethos which allowed Euro-Americans to indulge in one of the bloodiest displays of savagery and genocide the earth has known before or since — and to do so "with God on their side." It is an ethos into which most young Americans, regardless of race, are still indoctrinated. For native Americans, compulsory schooling in the Protestant -derived values, mercantile interests and competitive individualism of the American education system is just another means of conquest and extermination. Nineteenth century Euro-American Protestantism was an unsustainable religion and to pretend that Chief Sealth identified its deity with the sustainable spirituality of his people is a denial of their authentic history — a kind of cultural graverobbing which adds insult to the injuries already inflicted on tribal native Americans and the living earth with whom they once existed in community.

It is dispiriting to reflect on the pernicious effects of Perry's peculiarly effective piece of Protestant propaganda. For example, *Outlook Australia* invites children to compare Chief Seattle's phony speech with selections from *Kakadu Man*, the authentic words of Bill Neidjie, an eloquent Aboriginal elder who lives in East Arnhemland. Putting Neidjie's words in the context of the cozy universalism of Perry's text creates a climate conducive to learners *assimilating* Neidjie's worldview into their own, rather than appreciating that his words are constituted from an alternative discourse shaped by cultural assumptions and values that are very different from (and often in conflict with) their own.

Enough. May the spirit of Chief Sealth rest in peace and his authentic words live on to challenge us. But the sooner we bury — and forget — the phony text of "Chief Seattle's speech" the better it will be for us all.

Noel Gough is a senior lecturer in Curriculum and Teaching at Victoria College, 662 Blackburn Road, Clayton, Victoria 3168, Australia.

The Controversy of Chief Seattle

Noel Gough's article in the last issue of Clearing regarding the authenticity of Chief Seattle's "speech" touched a sensitive nerve among Clearing readers, and we received several responses. Most reacted positively to learning about this information, despite being disappointed. Others seemed to feel that it bordered on racism to even discuss this matter.

Our reaction at Clearing is to defend the discussion of this matter as essential for environmental education. It is in no way intended to be racist or demeaning to Native Americans. It merely seeks to clarify the origins of one of environmental education's primary tracts in order to protect the legitimacy of our efforts.

As anyone who has read Clearing for any length of time will know, we strongly believe that Native American peoples represent a true environmental ethic to which we should aspire.

Ultimately, we feel that Chief Seattle's "speech" has become a valuable "metaphor" to guide us in our efforts at healing the earth. Whether or not the words actually came from the Duwamish chief is less important than the fact that they represent an ethical model that we know, in fact, to be true.

In order to find out more about this controversy, we called the University of Washington Library to find out what documentation existed on this topic. We were sent a package that included Dr. Rudolf Kaiser's essay entitled "Chief Seattle's Speech(es): American Origins and European Reception" which he subtitles "almost a detective story." This essay outlines in detail the historical evolution of what has now become known as "Chief Seattle's Speech."

In the interest of historical accuracy, we are printing, in its entirety, the original version of Chief Seattle's "speech." On the following page is the article by Dr. Henry Smith describing the speech and events surrounding it. The article was titled "Early Reminiscences Nr. 10: Scraps from a diary - Chief Seattle - a gentleman by instinct - his native eloquence etc. etc." It was from this original article that all subsequent Chief Seattle speeches have been taken.

Dear Clearing:

The article by Noel Gough (Chief Seattle's Gospel: Chiefly Protestant Propaganda?, CLEARING #71, November/December 1991) was certainly provocative. I for one feel adequately provoked to respond. Perhaps I should begin by indicating my own bias. I have found the popularly circulated Chief Seattle speech to be one of the most inspirational passages that I have ever encountered. I consider Protestantism (and Christianity) to be a very poor (and very dangerous) metaphorical interpretation for the wordless mystery of human existence; and, I like John Denver's music!

You mention in the sidebar that the Clearing staff felt it important that "the truth be known." Unfortunately, what we got in the article was not the truth, but a diatribe by Gough against the excesses of Protestantism, a modicum of self-aggrandizement in his "note of self-righteousness," which was totally irrelevant to the subject at hand, and explicit instructions on how we were to henceforth relate to the passage in questions ("bury and forget" it).

It is very difficult to find models for the world as we would like it to be. The worldview of some Native Americans before the conquest seems to exhibit many of the qualities that we seek today in ourselves and in our culture. Gough is taken with this paradigm; he mentions in the article the "principles of harmony, community, relationship and balance that inform the spiritual lives of Native Americans." And yet the Native Americans were known to have indulged in excesses of their own. The Tlingits, for example, were reported to have crushed slaves to death beneath posts set up at house-building ceremonies. The Kwakiutls sometimes killed slaves on the beach in order to use their bodies as rollers for visitors' canoes (see C. Schwantes, The Pacific Northwest, 1989, pg. 30). The human condition is precarious and frought with hypocrisy in every culture, bound as we are to the fragmentary nature of thought and language.

It would be most interesting to know the truth. What did Chief Seattle/Sealth say, according to his interpreter? This was not revealed in the article. How much did Perry alter it? This fact was also omitted. If we have this much information, we would know to what degree the passage is Seattle's (and Smith's), to what degree Perry's.

And then, of course, the question arises, what difference does it make? Do the words move you when you read them? Do they resonate with some deeper knowing in your spirt that yearns to find expression? If so, perhaps the author, and even the condition of the author's mind at the time of writing (i.e. his/her motive) is irrelevant.

Hoka hey! It's a good day to die!

Dana Visalli
PO Box 175
Winthrop, WA 98862

Chief Sealth is Alive and Well, Thank You

To the editor:

What on earth are you "environmental educators" doing? Are your brains fibrillating from a capeccino-inspired caffeine rush, or what? Your decision to publish "Chief Seattle's Gospel: Chiefly Protestant Propaganda?" by Noel Gough in the Clearing Nov./Dec. issue clearly serves no constructive purpose. Once again Native American people are diminished and derided despite thousands of years of stewardship and reverence they have maintained for this earth.

What's the matter? Can't you stand the fact that the First People of this continent were living the tenets of "environmental education" long before it became vogue? I regard this attack on Chief Sealth's reputation as a racist insult revealing the depth of malaise endemic to world-wide pollution — perhaps a brain-numbing consequence of the pollution of the earth, air and water. But, is this evidence of something even more damning — pollution in environmental politics?

Let's set the record straight. Enclosed is the actual text of Chief Sealth's 1854 speech supplied by the Suquamish Tribe, guardians of Sealth's grave. The Suquamish Tribal Museum endorses only this version. Incidentally, Sealth spoke eloquently on a number of occasions on a wide variety of topics — that's one of the reasons Seattle is his namesake. In all fairness, please publish the entire text of the Duwamish chief's speech translated from the coast Salish/Chinook language and published in 1887 by Dr. Henry A. Smith from notes he jotted down 33 years earlier. Certainly you must recognize the disparity that exists in remembering and translating a spoken language rich with symbolism and analogy to written English, a language known for its imprecision.

First, the white man's hubris, intellectual conceit, self-delusion or whatever one chooses to call it, is revealed in Gough's patronizing admonition of succeeding authors interpretations of Sealth's words. Important is that Sealth was a voice from the past challenging us to cooperate for the future — his spirit is still with us.

Second, unremitting reliance on linear-logical-deductive-intellectual-technobabble-speak on environmental matters contradicts one of the basic tenets of EE — that we embrace a holistic, multi-disciplinary and multi-sensory approach.

Mere allusion to our sensory "resources" is not good enough. Allow me to be specific. We must have: sight, not just seeing but inner vision; sound, not just hearing, but listening for understanding; speech, not just talking, but sharing of insight, experience and commitment; taste, not just salivary, but selective for nourishment rather than satiation; touch, not just textural, but heartfelt and soulful; kinesthetic, not just physical movement, but the total body resonating as an organ in itself. Gough sounds like someone who has just joined the party. His energy, and yours, would be better applied to the task at hand: How do we teach environmental responsibility.

What this means in relation to Chief Sealth is that we trust the core of what has been passed down to us and that we validate his wisdom with cooperation, solidarity and brotherhood in the face of the relentless destruction being perpetrated against this earth.

The decision by Native American people to live in harmony with nature was no accident. It was a conscious choice. American Indian population in North America before European contact has been estimated at 16 million residents. It doesn't take a great leap of imagination to see that they had the capability , had they chosen to do so, to overwhelm the natural world even then. Consider that some East Coast tribes managed wildlife propagation by periodically burning selected forest areas. Collectively, North American tribes managed the salmon resource by allowing escapement during peak runs, by broodstock supplementation of barren streams and by harvesting only what they needed to live. The list is endless, if you take the time to examine history.

A much larger issue of racism is at stake when individuals like Gough take up the banner of scholastic hygiene and "political correctness." For a discussion of the real issue here, may I suggest you read Facing West: The Metaphysics of Indian hating and Empire Building by Richard Brinnon.

Sincerely,

Carson J. Boyesen

P.S. While I am a board member of the Environmental Education Association of Washington and work for the Northwest Indian Fisheries Commission, my views do not represent either organization.

The Original Version of Chief Seattle's Speech — as transcribed by Dr. Henry J. Smith in 1887

Old Chief Seattle was the largest Indian I ever saw, and by far the noblest looking. He stood nearly six feet in his moccasins, was broad shouldered, deep chested and finely proportioned. His eyes were large, intelligent, expressive and friendly when in repose, and faithfully mirrored the varying moods of the great soul that looked through them. He was usually solemn, silent and dignified, but on great occasions moved among assembled multitudes like a Titan among Lilliputians, and his lightest word was law.

When rising to speak in council or to tender advice, all eyes were turned upon him, and deep-toned, sonorous and eloquent sentences rolled from his lips like the ceaseless thunders of cataracts flowing from exhaustless fountains, and his magnificent bearing was as noble as that of the most cultivated military chieftain in command of the forces of a continent. Neither his eloquence, his dignity or his grace was acquired. They were as native to his manhood as leaves and blossoms are to a flowering almond.

His influence was marvellous. He might have been an emperor but all his instincts were democratic, and he ruled his loyal subjects with kindness and paternal benignity.

He was always flattered by marked attention by white men, and never so much as when seated at their tables, and on such occasions he manifested more than anywhere else the genuine instincts of a gentleman.

When Governor Stevens first arrived in Seattle and told the natives that he had been appointed Commissioner of Indian affairs for Washington Territory, they gave him a demonstrative reception in front of Dr. Maynard's office, near the water front on Main Street. The Bay swarmed with canoes and the shore was lined with a living mass of swaying, writhing, dusky humanity, until old Chief Seattle's trumpet toned voice rolled over the immense multitude, like the startling reveille of a bass drum, when silence became as instantaneous and perfect as that which follows a clap of thunder from a clear sky.

The Governor was then introduced to the native multitude by Dr. Maynard, and at once commenced, in a conversational, plain and straightforward style, an explanation of his mission among them, which is too well understood to require recapitulation.

When he sat down, Chief Seattle arose, with all the dignity of a senator who carries the responsibilities of a great nation on his shoulders. Placing one hand on the Governor's head, and slowly pointing heavenward with the index finger of the other, he commenced his memorable address in solemn and impressive tones:

"Yonder sky has wept tears of compassion on our fathers for centuries untold, and which, to us, looks eternal, may change. To-day it is fair, to-morrow it may be overcast with clouds. My words are like the stars that never set. What Seattle says the great chief, Washington, can rely upon, with as much certainty as our pale-face brothers can rely upon the return of the seasons. The son of the white chief says his father sends us greetings of friendship and good-will. This is kind, for we know he has little need of our friendship in return, because his people are many. They are like the grass that covers the vast prairies, while my people are few, and resemble the scattering trees of a wind-swept plain.

The great, and I presume also good, white chief sends us word that he wants to buy our lands but is willing to allow us to reserve enough to live on comfortably. This indeed appears generous, for the red man no longer has rights that he need respect, and the offer may be wide, also, for we are no longer in need of a great country. There was a time when our people covered the whole land as the waves of a wind-ruffled sea cover its shell-paved floor. But that time has long since passed away with the greatness of tribes almost forgotten. I will not mourn over our untimely decay, nor reproach my pale-face brothers with hastening it, for we, too, may have been somewhat to blame.

When our young men grow angry at some real or imaginary wrong and disfigure their faces with black paint, their hearts, also, are disfigured and turn black, and then their cruelty is relentless and knows no bounds, and our old men are not able to restrain them.

But let us hope that hostilities between the red man and his pale face brothers may never return. We would have everything to lose and nothing to gain.

True it is that revenge, with our young braves, is considered gain, even at the cost of their own lives, but old men who stay at home in times of war, and old women who have sons to lose, know better.

Our great father Washington, for I presume he is now our father as well as yours, since George has moved his boundaries to the north; our great and good father, I say, sends us word by his son, who, no doubt, is a great chief among his people, that if we do as he desires, he will protect us. His brave armies will be to us a bristling wall of strength, and his great ships of war will fill our harbors so that our ancient enemies far to the northward, the Simsiams and Hydas, will no longer frighten our women and old men. Then he will be our father and we will be his children. But can this ever be? Your God loves your people and hates mine; he folds his strong arms lovingly around the white man and leads him as a father leads his infant son, but he has forsaken his red children; he makes your people wax strong every day, and soon they will fill the land; while our people are ebbing away like a fast-receding tide, that will never flow again. The white man's God cannot love his red children or he *would protect them. They seem to be orphans and can look nowhere for help. How then can we become brothers? How can your father become our father and bring us prosperity and awaken in us dreams of returning greatness?*

Your God seems to be partial. He came to the white man. We never saw Him; never even heard His voice; He gave the white man laws but He had no word for His red children whose teeming millions filled this vast continent as the stars fill the firmament. No, we are two distinct races and must ever remain so. There is little in common between us. The ashes of our ancestors are sacred and their final resting place is hallowed ground, while you wander away from the tombs of your fathers seemingly without regret.

Your religion was written on tablets of stone by the iron finger of an angry God, lest you might forget it. The red man could never remember nor comprehend it.

Our religion is the traditions of our ancestors, the dreams of our old men, given them by the great Spirit, and the visions of our sachems, and is written in the hearts of our people.

Your dead cease to love you and the homes of their nativity as soon as they pass the portals of the tomb. They wander far off beyond the stars, are soon forgotten and never return. Our dead never forget the beautiful world that gave them being. They still love its winding rivers, its great mountains and its sequestered vales, and they ever yearn in tenderest affection over the lonely hearted living and often return to visit and comfort them.

Day and night cannot dwell together. The red man has ever fled the approach of the white man, as the changing mists on the mountain side flee before the blazing morning sun.

However, your proposition seems a just one, and I think my folks will accept it and will retire to the reservation you offer them, and we will dwell apart and in peace, for the words of the great white chief seem to be the voice of nature speaking to my people out of the thick darkness that is fast gathering around them like a dense fog floating inward from a midnight sea.

It matters but little where we pass the remainder of our days. They are not many. The Indian's night promises to be dark. No bright star hovers about the horizon. Sad-voiced winds moan in the distance. Some grim Nemesis of our race is on the red man's trail, and wherever he goes he will still hear the sure approaching footsteps of the fell destroyer and prepare to meet his doom, as does the wounded doe that hears the approaching footsteps of the hunter. A few more moons, a few more winters and not one of all the mighty hosts that once filled this broad land or that now roam in fragmentary bands through these vast solitudes will remain to weep over the tombs of a people once as powerful and as hopeful as your own.

But why should we repine? Why should I murmur at the fate of my people? Tribes are made up of individuals and are not better than they. Men come and go like the waves of the sea. A tear, a tamanamus, a dirge and they are gone from our longing eyes forever. Even the white man, whose God walked and talked with him, as friend to friend, is not exempt from the common destiny. We may be brothers after all. We shall see.

We will ponder your proposition, and when we have decided we will tell you. But should we accept it, I here and now make this the first condition: That we will not be denied the privilege, without molestation, of visiting at will the graves of our ancestors and friends. Every part of this country is sacred to my people. Every hillside, every valley, every plain and grove has been hallowed by some fond memory or some sad experience of my tribe. Even the rocks that seem to lie dumb as they swelter in the sun along the silent seashore in solemn grandeur thrill with memories of past events connected with the fate of my people, and the very dust under your feet responds more lovingly to our footsteps than to yours, because it is the ashes of our ancestors, and our bare feet are conscious of the sympathetic touch, for the soil is rich with the life of our kindred.

The sable braves, and fond mothers, and glad-hearted maidens, and the little children who lived and rejoiced here, and whose very names are now forgotten, still love these solitudes, and their deep fastnesses at eventide grow shadowy with the presence of dusky spirits. And when the last red man shall have perished from the earth and his memory among white men shall have become a myth, these shores shall swarm with the invisible dead of my tribe, and when your children's children shall think themselves alone in the field, the shop, upon the highway or in the silence of your woods they will not be alone. In all the earth there is no place dedicated to solitude. At night, when the streets of your cities and villages shall be silent, and you think them deserted, they will throng with the returning hosts that once filled and still love this beautiful land. The white man will never be alone. Let him be just and deal kindly with my people, for the dead are not altogether powerless."

Other speakers followed, but I took no notes. Governor Stevens' reply was brief. He merely promised to meet them in general council on some future occasion to discuss the proposed treaty. Chief Seattle's promise to adhere to the treaty, should one be ratified, was observed to the letter, for he was ever the unswerving and faithful friend of the white man. The above is but a fragment of his speech, and lacks all the charm lent by the grace and earnestness of the sable old orator and the occasion.

Information courtesy of University of Washington Library, Seattle, WA.

To the editor:

You bet you should have run the article about Chief Seattle's speech. I have always hated the trite and obvious in environmental education, feeling that an environmental ethic is in itself obvious.

I like that you presented "the other side" about this speech. We used to show a film using Chief Seattle's speech in EE at Everglades National park. One could interpret such "pop" renderings of a real cultural interchange as in themselves exploitive of both Native people and the environment. I think you did it right in bringing this article to light.

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THINKING LIKE A PLANET

BY REID CREASE

In an eloquent conclusion to one of the chapters in *The Dream of the Earth*, Thomas Berry states, "In relation to the earth, we have been autistic for centuries. Only now have we begun to listen with some attention and with a willingness to respond to the earth's demands that we cease our industrial assault, that we abandon our inner rage against the conditions of our earthly existence, that we renew our human participation in the grand liturgy of the universe."

A recent Peel Board Outdoor and Environmental Education Conference created the slogan "Earth whispers... are we listening?" Many educators who have tried to gain a perspective on the massive environmental issues facing us now and into the next century would probably argue that the earth is not whispering — it has been screaming for the last two hundred years. As educators approaching the third millennium, our greatest challenge will be to teach our children, indeed our entire human community, to listen to the voices of the earth and to move beyond knowledge to understanding, beyond understanding to responsible action in all of our person/planet relationships.

Just as I was beginning to focus my own global perspectives in 1989, I reread the "Thinking Like a Mountain" essay by Aldo Leopold in his classic *A Sand County Almanac*. In this beautiful essay, Leopold describes being on a deer hunt when he and friends come upon a wolf pack. In those days, when the thinking was that fewer wolves meant more deer and therefore no wolves meant a deer hunter's paradise, the young hunters opened fire. Leopold recalls getting to the side of an old wolf just in time to see that "fierce green fire dying in her eyes."

That event changed his life. In a sense, it rid him of his earth autism. When he saw that fire die, he realized that only the mountain has lived long enough to understand the howl of a wolf. The mountain understood that the howl meant balance. No wolves, too many deer, destruction of the mountain flora, erosion of the mountain. "A deer pulled down by wolves can be replaced in two or three years but a mountain range pulled down by too many deer may fail of replacement in as many decades."

In reflection, I decided that if thinking like a mountain was a transformational event for Aldo Leopold in 1910, then thinking like a planet would be necessary for us in the 1990s. How do we teach our children to move beyond shallow ecology and the quick environmental fix to feel the essence of their connection to the planet? How do we teach them to listen to the voices of the earth? As environmental educators we have the opportunity to be closer to those voices. And if any group should strive for an understanding of natural systems, it should be us. However, sometimes I sense that in our relationship with the earth, we have been more like the grasshopper than the ants. What deeper inner journeys do we need to take and what will be our guiding principles as we collectively begin thinking like a planet?

Father Thomas Berry has observed that we are passing out of the Cenozoic and entering the Ecozoic Age. We are now at the period of flux where the former has not yet been buried and the latter not yet baptized, giving a certain edge to the ancient Chinese proverb "May you be born in interesting times." Berry states in *Befriending the Earth* that there are several guiding principles which will become conditions for survival in the Ecozoic Age:

- The universe is a communion of subjects, not a collection of objects.
- The earth exists and can survive only in its integral functioning.
- The earth is a one-time endowment.
- The human is derivative, the earth is primary.
- Unlike the Cenozoic, the Ecozoic Age will require our responsible involvement in almost everything that happens — accepting

Thinking Like a Planet (continued)

protecting and fostering natural processes.

- We will need new ethical principles which recognize the absolute evils of biocide and geocide.
- We will need a new Ecozoic language and legal system based on planetary primacy.

Education in the Ecozoic Age, Berry contends, will be the telling of the universe story in all its richness: how it began, how it came to be as it is, the human role in the story, everything.

Matthew Fox, another eco-theologian, shows that these principles begin in our earliest myths and that we need to bond ourselves and our children to a new cosmic creation story. In *Creation Spirituality*, Fox describes how a creation story "grounds us in the history of how we arrived here, and it awakens awe and wonder that we are here. When this happens, we are less subject to manipulations, to trivia, to trivializing distractions, addictions and consumerism. Awe and amazement are the results of a rich creation story, and the awe we feel should encompass our very selves, since very self is part of the unfolding creation story. We feel our interconnection with other creatures and peoples on this surprising planet in this amazing universe of one trillion galaxies, each with 200 billion stars."

It is not surprising that both of these men have been placed under vows of silence by the Vatican. This is revolutionary thinking to promote a cosmology that does not reflect the anthropocentric viewpoint that the universe revolves around human needs and wants. To begin to think like a planet, to move away from the anthro- to the ecocentric perspective, requires a dramatic shift in some of our most sacred belief systems and social structures. Barry Commoner, in *Making Peace With the Planet*, calls this a massive transformation wrought with potential conflict. He says that to bring the present structure of the technosphere into harmony with the ecosphere means totally "redesigning the major industrial, agricultural, energy and transportation systems" and that such a transformation directly conflicts with current short-term economic and political interests.

While conflict may be an inevitable part of the move from an anthropocentric to an ecocentric worldview, failure to do so will be mutually destructive for human society and all planetary systems. The premise is simple: you cannot have a healthy humanity on a sick planet. In order to achieve a healthy planet, humans must begin to listen to the earth and rediscover their place as members of the earth community. We must begin to move from a dominator to a partnership society as described so clearly in Riane Eisler's *The Chalice and the Blade*.

These partnership skills are particularly evident in outdoor education where we are often teased about the preponderance of cooperative games and everybody wins "competitions." But the skills learned in these activities, and in our initiative courses and adventure programs are exactly the skills needed to move us towards that partnership model. In order to move through this period of social systems conflict, humanity will need all of the "silver bullets" it can possess. When we take that deep breath and begin to think like a planet, we recognize the absolute importance of cooperative community as a survival mechanism for the twenty-first century.

Many brilliant minds have given voice to the current state of our person/planet relationships and what we need to do to move into harmony. Fritjof Capra says we need to develop an "ecological perspective." Robert Ornstein and Paul Ehrlich call it a "conscious evolution" towards a new world with new minds. Jeremy Rifkin declares that we need to "reparticipate with biosphere." Bill Devall says we need to develop an "ecological self" with "a sense of place." David Suzuki states emphatically, "Ecological awareness informs us of our place within, and dependence on, an intact planetary biosphere that must subsume all other human priorities." I think we all, collective and integrated, need to begin thinking like a planet. We need to tell our creation story as a planet and a people. We need to celebrate our unique humanness with pride and to take our places as simple members of the complex earth community with great humility and awe.

I believe in my heart of hearts that environmental educators, close to the voices of the earth and skilled in cooperative social interaction, can provide the leadership needed to successfully bridge the chasm that exists between the Cenozoic and Ecozoic Ages, between an anthropocentric and an ecocentric worldview. The force that will drive us will be love — a love of the earth, ourselves and our children, and all living things yet to come.

When Thomas Berry was asked why he was putting himself through all the conflict and turmoil of challenging sacred traditions and dominant worldviews, he answered quite simply: "The children. I cannot bear to leave the children a planet any more devastated than I can help. So I say simply that I do it for the children." For the children and with the children, I hope that we can all begin thinking like a planet.

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CLEARING
environmental education in the pacific northwest

Meeting the Mandate:

Planning for Teaching Environmental Studies

Environmental education is now required in Washington schools. How do teachers go about making it a part of their curriculum?

by Bob Graef
Paragon Publications

We keep hearing about a "Mandate" to implement Environmental Studies in Washington's public schools. Many of our "green" friends, naively assuming all educational planners share their zeal, believe in their hearts that the mythical mandate is designed to infect all school kids with a respect for their world and its inhabitants. Not a chance.

In Washington State, the SPI's directive reads like this: "... each such school district shall offer all required courses for a high school diploma as provided in chapter 180-51 WAC and shall provide an opportunity for high school students to take at least one course in the following areas of study: (a) Art; (b) Career education; (c) Computer education; (d) Consumer education; (e) Economics; (f) Environmental education; (g) Foreign language; (h) Health education; (k) Home and family life; (j) Music; (k) Remedial education, including at least remedial education in reading, language arts and mathematics."

With schools having to offer elective courses in all the above areas, it follows that counselors will have to spread their students around to keep the full spectrum of mandated courses alive. At best, some high school students will opt for an Environmental elective. That's not enough when the objective is to change a population's collective mind about how our planet should be cared for.

When Environmental Education schemes in western schools are compared, a spread of approaches can be found that is at least as varied as the mind-sets of the planners who dreamed them up. For simplicity's sake, let's group them into four classes:

1. Implementing the Washington State mandate within a defined course of study.

2. Imposing a sequence of courses, organized by course, units, and content, into a 6-12 spiral.

3. Assigning units of environmental education content wherever it is contextually consistent and appropriate to students' maturity.

4. Inserting environmental units into the cracks between existing units. (The "wedge")

Implementing the mandate. Give this scheme an A+ for ease of management. Definitely the administrators' top pick for its neatness of packaging. Responsibility for environmental education is locked down to one teacher in one room. Program review and accountability couldn't be tidier.

But: Only a fraction of the students in any K-12 program would be exposed to it. Therefore, simple adherence to the SPI's mandate falls far short of doing the job. Once again, we have an example of the easiest scheme being the least acceptable. Does that mean that the right plan is next to impossible?

Imposing a sequence of courses. This is a dream. We're competing for additional instructional time with every subject area. Every one of them can build a good case, so energy spent pursuing this as a valid possibility will be wasted.

But that doesn't mean we can't wring some merit from the scheme. We need idealistic pie-in-the-sky schemes whenever we want to set down the pattern of our most ambitious, idealistic, far-ranging plans. When planning begins, it is entirely proper to flesh out an entire Big Picture — understanding of course, that practical realities will bring our sights down somewhat.

Assigning appropriate content. This most-useful exercise probably won't translate directly into an educational scheme, but its focus on learners and existing curriculum makes it a practical tool. However, responsibility for handling such a program is spread so broadly that one can lose track of who's doing what, and how well they are doing it.

Careful attention is given to the maturity and cognitive background of students at each grade. Natural tie-ins with both existing curriculum and learning characteristics of particular age-levels help determine assigned content. All this is well and good, but the vision it evokes of a perfectly articulated and complete program has to be tempered.

The "wedge." Some planners who find no slack in the curriculum stuff their content into the cracks between existing units or courses. That's how inter-term "mini-courses" came to be. But given the staying-power of mini-course programs, they should be considered "soft-time," here today, gone tomorrow. Planning this way is more a mechanical than mental project. One can drop bits of content onto the cracks and then force it into the gaps. But what happens, likely as not, is content falling through the cracks.

If a district commissions a committee to plan an environmental education program, but fails to provide space in the curriculum, this is what sometimes happens. Here we have another example of an easy way being less productive.

All the above is the long way of saying: statements of governmental good intentions don't naturally translate into sound education plans, and sound educational plans don't easily translate into instruction. And so we need some simple tools. Try these:

Ala Carte Primary Planning

First, assume that most of the important current environmental issues have attracted the thoughts of many of our best thinkers. If so, then all we have to do to outline a course of studies is to line up a thorough array of their recent writings and reports. We can find these listed in the tables of contents and indexes of recommended books on the environment. Working from a collection of ten or more books, one can pick and choose topics which will form a skeletal outline for instruction. When every member of a team works independently, passing source books back and forth, it is amazing how close all come to consensus in one session.

Secondary Planning: Filling in the Outline

Just as chapter headings provide the best bones for the curriculum skeleton, index entries are an efficient source for beginning to flesh it out. I found it useful to compare indexes of a number of environmental source-books for compiling a list of research headings, a list which, once I attached Dewey Decimal numbers, became both a librarian's cataloging guide and a student's research guide.

If one approaches this index-entry search with a head full of questions, the job will yield all sorts of useful results. Consider how these questions might generate pages of useful notes:

What topics are most appropriate to K-3? 4-6? 7-9?

Are there certain headings which ought naturally to precede or follow other topics?

Which topics might be best understood in a special lab or non-classroom environment?

Which topics naturally identify with existing courses of study?

Which topics touch on locally sensitive issues?

... and so it goes.

You have here a tool as simple and purposeful as a cave-man's hand axe. Its purpose is just as simple: to bridge the gap between recognized need for environmental education and sound educational plans. Then it stops right there, short of invading the individual teacher's planning inspiration. Besides, most of CLEARING is dedicated to helping with that.

One final cautionary note: We know that without benefit of an SPI's mandate or district-level coordination, good environmental education is already taking place in thousands of classrooms. The excellent efforts by teachers who are already leading children into an abiding commitment to the environment should figure in any curriculum scheme, so planners should first find out who is doing what. There's no better preparation than surrounding yourself with teaching talent that has already tested ideas and materials.

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Exemplary E.E. Programs in the Pacific Northwest

The Eastwood Project

Oregon's 1992 Teacher of the Year shares the development of a program that has caught the attention of educators throughout the region

by Daniel M. Tilson

Eastwood School is a K-6 school located in Roseburg, Oregon, a town of about fifteen thousand. We at Eastwood are in a unique position in the state of Oregon. The school sites on a forty four acre site that has a wide variety of plants and animals, and a year-round creek. We are the county site for the emotionally disturbed and severely handicapped children. Eastwood School has been identified as an Oregon School of Excellence. Our staff members have been recognized for their leadership in education, with awards such as the Christa McAuliffe Fellowship, the Presidential award for Excellence in Teaching Science, and Oregon Teacher of the Year.

Eastwood is one of the few schools in the state with access to a salmon spawning creek. We were fortunate enough to have the Douglas county Salmon Habitat Improvement Program and the Oregon Department of Fish and Wildlife become involved in a stream enhancement project that includes an on-site salmon hatchery. This project has received wide recognition throughout the Pacific Northwest and is becoming a showplace for other Oregon schools to visit and learn.

In the Beginning

In the spring of 1987 one of our county Commissioners, Doug Robertson, visited a stream enhancement project in Washington and brought the idea back to Roseburg. Doug convened a meeting of those interested in a project at Eastwood School. He presented the idea of establishing a hatchbox site at Eastwood School for the purpose of re-establishing a run of Fall Chinook Salmon to Deer Creek, which borders the school grounds. At the same time Robertson wanted to educate the students of Eastwood about the life cycle and habitat needs of the salmon. The idea was well received by those involved in stream enhancement which included the Oregon Department of Fish and Wildlife (ODFW), Pacific Power and Light, Douglas County Salmon Habitat Improvement Program (SHIP) and the Eastwood staff.

The initial plans were developed by the county under the direction of Doug Robertson and the ODFW and within a month we had a set of plans finalized. The plans then went to the Salmon Habitat Improvement Program committee for funding. The initial estimate was for about $20,000 in materials and another $20,000 in equipment and labor. the materials were purchased from grant monies received from the SHIP committee; labor and equipment were donated by various community organizations including ODFW and several county departments.

By the fall of 1987 we were ready

Exemplary E.E. Programs in the Pacific Northwest

for our grand opening. The first year we raised 5,000 Fall chinook 5,000 Coho and 5,000 Winter Steelhead. With the help of the Umpqua Fishermen's Association we were able to add two additional hatchboxes. The county continued to be involved in our project whenever possible. They worked with us to solve some of our pump problems and donated gravel and equipment to build a road to the hatchery.

In 1988 we were able to add two 1,000 gallon rearing tanks to our hatchery with grant monies received from the Christa McAuliffe fellowship program for the project. In 1990, with the help of the Roseburg Jaycees, we were able to complete a $15,000 roof for our hatchery and add automatic feeders.

We are now in the final stages of completing a $60,000 on—site fish hatching project, and now have hatch boxes and rearing tanks for 40,000 Steelhead, Coho and Chinook salmon. We are in our fifth year of this successful rearing project. Our main gaol still being to restore a run of Fall Chinook salmon to Deer Creek and educate the students about salmon environment and life cycle. Students are involved in the daily caring of the eggs, including egg picking, water quality and record keeping. Some students are assigned to come on the weekends to check the eggs and equipment. In the classroom the students learn about salmon life cycle and conservation of our water resources. Eastwood students are also involved in a classroom project to educate the land owners who live along Deer Creek about the Eastwood Project, the importance of riparian areas, how watersheds affect stream quality and conservation of our water and soil resources. This summer students, parents, staff, community members and the ODFW will be involved in a continuation of an enhancement project on the portion of Deer Creek that borders our property.

Exemplary Programs

Eastwood Wildlife Project

The 44-acre grounds which is the site of Eastwood Elementary School offers a unique opportunity to create a viable wildlife habitat and conservation education area. The work already accomplished by Eastwood School, the ODFW, the STEP volunteers, Douglas County Salmon Habitat Improvement Program, Umpqua Fishermen's Association, Douglas Timber Operators, students, parents, and others has been considerable. This, combined with the strong public interest and publicity, imply this project can benefit the entire community.

We have two main goals for the Eastwood Wildlife Project. The first goal is making the area accessible and usable all year. To accomplish this we've had heavy equipment donated by the Douglas Timber Operators to level and smooth the trail. We were able to secure a grant in the amount of $14,200 from the Soil and Water Conservation Service to improve runoff and drainage in the trail area. We have received a grant from the C. Giles Hunt foundation to pave a portion of the trail for our wheelchair-bound students. Study sites have been selected and marked by students and parents with 4x4 posts which were donated by a local mill. Several Eagle Scout projects are underway or completed, providing outdoor classrooms for student use.

The second goal is to attract native animals to the wildlife area, enhance and improve the already existing system of trails, provide outdoor classrooms and lab areas for use by students and teacher. Local conservation groups such as Umpqua Audubon society, Izaak Walton League and the OSU Extension Service have helped by identifying different species of plants and animals that inhabit the area. In the fall of 1990 the ODFW, with the help of Eastwood students, released twenty eight wild turkeys on our property. Teachers are using the area for lessons in conservation, English, art, science, math and social studies.

To properly construct the habitat several steps were taken. Selective brush removal and clearing are required throughout the project area. For the last two summers Eastwood was chosen as a model project site for an Oregon Youth Conservation Corps crew. This crew worked on the project clearing brush, building trails and constructing several specialized brush piles with some of the cleared material. Some brush piles were tailored to medium-sized mammals, others to small animals and birds, offering them protection from predation. Two will be on elevated platforms for quail with broodrearing cavities. These areas will also provide excellent study sites for the observation of a wide variety of animal habitats. Throughout these phases of ground work, many of the existing trees and shrubs will be left undisturbed.

Another area of development is the wetland area. Eastwood has received a $20,000 grant from the Governors Watershed Enhancement Board (GWEB) to construct the wetland area, plus funds for instream and classroom activities. The wetland was finished in the summer of 1990 and by fall was full of water. It is already home to Mallard ducks, geese, turtles, frogs, crayfish and other aquatic animals. We are constantly seeing our population of White-tailed deer use it as a watering hole. We are hoping a pair of Mallard ducks will choose the island in the center as a nesting site. The area has been planted with riparian and aquatic food producing plants. Study sites with observation blinds will be constructed as the wetland area will offer unique opportunities for classroom observation of migratory waterfowl and aquatic habitats. Students from all over Douglas County will have an opportunity to study the importance of wetlands and aquatic environments in conservation education.

Planting and construction of browse control will be conducted in the fall, winter and early spring. four thousand softwoods, including Douglas fir, Ponderosa Pine and KMX Pine will be planted in pure stands. Some of these trees will be planted as a cooperative effort between the OSU Extension service and the first and sixth grades. These softwoods will offer food, shelter and nesting sites to many species. In other areas five thousand wildlife food producing shrubs and trees, along with grasses, legumes and grains, will be properly planted. We are now in the process of working with local tree nurseries, OSU Extension, land improvement companies and the Douglas Timber Operators to help us in this area of the project. The plant list is long and is comprised of plants that can grow in the available soils and provide natural food and minerals to many wildlife species.

The next phase of our development is to bring the human element into the project. With the help of the Roseburg office of the BLM and a grant of $35,000, plans are underway to construct a native Umpqua Indian site and dwelling. along with this will be interpretive displays on the Indians and their environment, and traveling artifact trunks that will be available to classes who would be visiting the site.

There are no quick fixes for long term problems. Through the last hundred years man has had a minimal concern for the earth on which he lives. Just in the last several decades has the human race begun to understand the complex workings of the world around him. Where do we begin to solve some of the problems that now face us and will continue to linger well into the next century? We at Eastwood feel the best place to start is with those who will be making the decisions in the future, the children of today. The students at Eastwood Elementary School are not just taught environmental education, they experience it!

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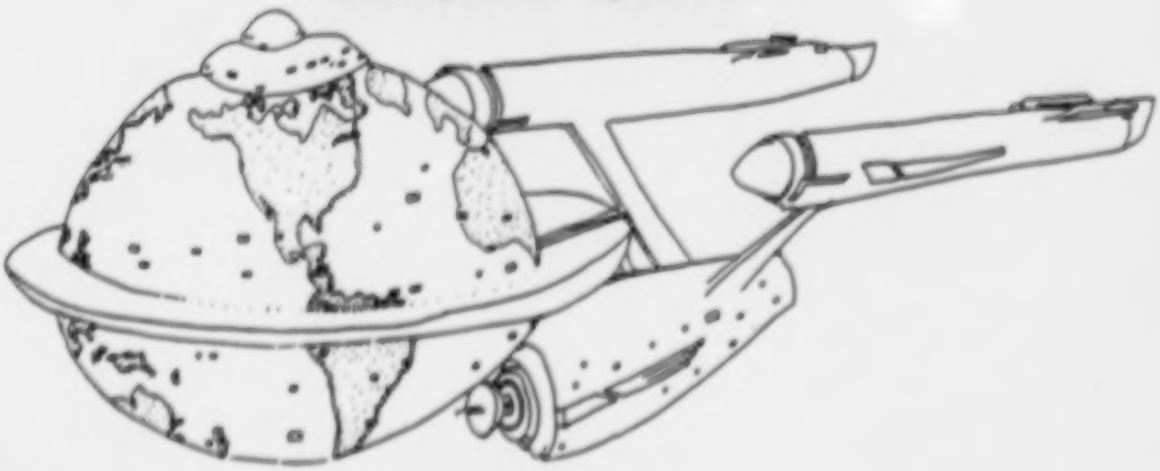
Exploring Global Issues Through Metaphor

Spaceship Earth



by Gloria Snively

Understanding global issues is, in most schools, a neglected aspect of education. Why do schools teach almost nothing conceptual about important natural systems that sustain life on the planet Earth— of the seashore and the forest, the deserts and mountains, of cities and nations — and of how they interact? Even teachers and parents with children cannot give a reasonable account of concepts such as quantity, pattern, whole, parts, life, connect, system, change, beauty, ugliness, love, value and so on.

A frequent method of teaching ecology and resource management is to explain the concepts of interest, conduct laboratory experiments, and test the students' ability to match meanings with the standard, adult scientific interpretation of the concepts found in the answer key. Typically, science teachers rarely ask students to produce or interact with language beyond a rote memorization phase. All too often students are spectators, and not active participants in the learning process. It is no wonder that many students appear to lack the reasoning power, or interest, to cope with complex ecological processes, or to work towards solving environmental problems of global proportions.

Increasingly, there is an urgent demand for intelligent, enlightened action which will lead to a future that benefits the entire Earth. The emphasis is on understanding global ecological systems, universal concerns rather than regional ones, and even these are seen as inextricably bound to the welfare of all (Darling, 1986; Hicks, 1982; Kniep, 1986). The 1987 report known as *Our Common Future* calls for a change in human attitudes which

Spaceship Earth

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depends "on a vast campaign of education, debate and public participation... to help the peoples of the world to enlarge their spheres of cooperation." Even though we have begun to articulate what a global education means, there are difficulties in moving beyond this initial step. Metaphor is a powerful tool for helping us transcend regional boundaries and emphasize our common humanity.

This article examines the use of instructional metaphors to help students understand basic ecology, explore resource issues of global proportions, and construct solutions.

The "Spaceship Earth" Metaphor

Two decades ago, the photographs beamed back to us of the Earth rising above the horizon of the moon created a fundamental change in human perception of the planet Earth. The sudden reality of Earth as a blue planet, floating in space — finite, water-cooled, teaming with life, along — created a new vision that no lecture on ecology or earth ethics could ever have accomplished.

Such images give striking physical metaphors for analytic constructs such as Buckminster Fuller's "Spaceship Earth" and Marshall McLuhan's "Global village.". These images capture and hold our attention. viewed from the moon we can see that we really do occupy just a tiny speck in space, and we're forced to think not big, but small. Now we do not look outward to the vastness of space, but inward to the boundaries of Earth. A theme critical to Buckminster Fuller's writings is that unless we change the way we think and behave, soon there may be no live humans aboard our tiny "Spaceship Earth."

The "Spaceship Earth" metaphor helps us realize that as astronauts in space, we must use everything wisely because there are just enough resources for the journey. Our Earth is a giant spaceship flying at thousands of miles an hour with over five billion people on board. Our food, air, and water supplies are precious and must be used wisely for us to survive. Nothing can be wasted. Everything that can be recycled must be recycled.

Similarly, the "Spaceship Earth" metaphor helps us realize that just as a hull protects the occupants of any "Spaceship," so our atmosphere protects us, and allows the conditions under which we live. The clouds surrounding Earth help us realize that the oceans and the atmosphere form a single, colossal circulatory system; a thin membrane directly responsible for temperature and humidity control, a system which protects and keeps the planet alive. The fact is, the layer of clouds is so thin that the depth can be compared to the layer of shellac on a globe. What is important to understand is that our "Spaceship Earth," like any ship, is a closed system because it has a limited ability to store or disperse the normal waste products of life. Most of what we throw into our rivers and oceans, or put into the air just seems to disappear. Chemicals and sewage put into our ocean from outfall pipes, pollutants dispersed from high smoke stacks, chemicals which sink oil spills in the ocean — are wonderful inventions for delocalizing a problem, and appear to make the problem go away. These by-products of our industrial lifestyle do not really disappear or even escape, but are bound to the Earth by gravity. Some do not float at the Earth's surface, but rise to their own density levels somewhere in the mix of gases we call the atmosphere. There, bounced about by countless particles, they change the nature of the atmospheric skin of our "Spaceship Earth." According to Spratt (1987), we are in danger not only of corrupting the life-support system of our Earth with pollutants, but with respect to the hole in the ozone layer, we have degraded the hull by making it thinner, and, in fact, "have punched a hole in it." In many ways this perspective of our planet is not a metaphor, for we truly are on the spaceship moving through space as the universe expands.

Classroom Activities

Because students attempt to cope with the complex and the unfamiliar by searching for an image and a way of describing it that will help them make sense of it, teachers should create instructional metaphor which would allow students to explore specific concepts, and they should be careful listeners for the metaphors that students spontaneously generate during instruction. If teachers see their task as one of helping students make sense of the natural world, they will allow students the opportunity to do so, and they will say "It's like a...," or "Let's suppose that..." or "Scientists have suggested that...."

Rather than saying "beware of metaphors," perhaps a better method is to deliberately push students to and beyond their limits. "How is the planet Earth like a spaceship, and not like a basketball? for example, the "Spaceship Earth" metaphor could be elaborated as follows:

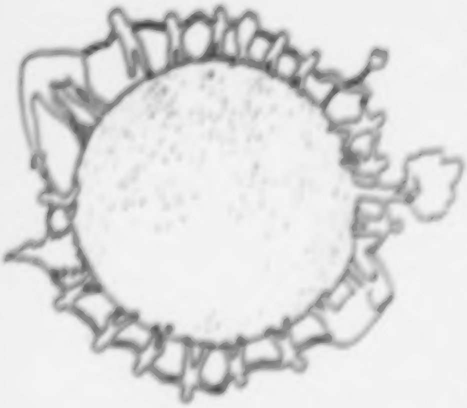
If the planet Earth were a spaceship, what would be its:

passengers
heater
air conditioning
spaceship frame
fuel
exhaust
enemies
defense system
commander
owner
mission

- Why?
- What could be the spaceship's mission?
- How many people are on board?
- How can we use our food supply wisely in order to survive?
- Could the spaceship run out of fuel? Why or why not? What would happen?
- What happens to the exhaust? Does the spaceship store or disperse its waste products?
- Does the spaceship have any enemies? If so, what/who are they?
- If we could write an "Operating Manual for Spaceship Earth," what would we write?
- How is the Earth not like a spaceship?

A Classroom Discussion

In the following classroom dialogue, the students are nearing the completion of their "Earth Week" activities. The teacher had explored with the students a range of regional and global environmental issues. In the discussion, the author teaches the class and uses "The Earth is a spaceship" metaphor as a catalyst to explore the related concepts: interdependence, pollution, survival, management, community, and system.



Author: If you were to make connections between the planet Earth and a spaceship, what connections, or similarities, would you make?

Mark: It travels.

Jennifer: It's in space. They're both in space.

Susan: People are always moving around. They live on a spaceship. There's life aboard both.

Kevin: They both move at high speeds. They both rotate.

Author: O.K. Thinking about the Earth as a spaceship, who would be the passengers — or astronauts?

Mary: Humans.

Author: Anyone know how many?

Jimmy: About 7 billion.

Author: Probably closer to 6 billion, but a lot of people for sure. What other passengers would be on the spaceship?

Susan: Animals. Bugs.

Jennifer: All living things.

Author: What would be the heater?

Sally: The sun.

Author: Would the sun be important?

Sally: Yes, we would freeze.

Mary: For light.

Jennifer: For growing plants.

Author: Would we have any air conditioning on our spaceship?

Mark: Clouds, trees.

Dawn: The water. The snow and ice.

Author: What would be the spaceship's frame?

Mark: The crust of the Earth would be the frame.

Author: Could there be anything else that could be the hull?

Kevin: The ozone.

Author: What makes you think that?

Kevin: The ozone protects the Earth from ultraviolet rays.

Author: Good. What else might be the hull?

Jimmy: The gravity helps keep it together.

Author: O.K. Good. What might be the fuel?

Jimmy: Gravity. It's pulling things down.

Susan: The planet makes its own fuel.

Author: How does it do that? That's a good idea.

Susan: The core of the planet mixing with gases.

Jennifer: The air. The trees creating oxygen, they breathe.

Author: do we have any exhaust?

Susan: Pollution. Garbage.

Sally: Air pollution, car exhaust, smog.

Author: What makes up smog?

Sally: Burning tires.

Jimmy: CFCs.

Author: My, that's a very big word. Who knows what that word means?

Sarah: Chlorofluorocarbons.

Author: Wow! I can see that you know a great deal about pollution. What are chlorofluorocarbons?

Susan: Aerosol sprays.

Sarah: Styrofoam.

Mark: Acid rain.

Author: All kinds of pollutants. Can we get rid of these pollutants? Can we just shoot it out into space?

Kevin: No. Because we have gravity.

Author: That's right. We can't get rid of air pollutants. They rise to their own weight levels and they just stay there. So what do you think the pollutants are doing to our spaceship frame?

Kevin: They're putting a hole in it. Like there's the hole in the ozone.

Author: Great. You've mentioned a lot of enemies. Can you think of any more?

Jennifer: Ourselves.

Author: Why do you say that?

Jennifer: Well, we're always fighting and wars cause pollution.

Author: Do you think we can stop that?

Jennifer: I don't think so, we're always fighting.

Mary: I think ourselves too, because we're always polluting.

Author: Can we stop that? What could we do to defend the system.

Mary: Recycle.

Jennifer: Composting.

Jimmy: Stop cutting down the tropical rainforest.

Author: Why?

Rory: The trees help make oxygen and that cuts down on the CO2 in the atmosphere.

Author: Good. Any other ideas?

Kevin: Selective logging.

Jennifer: Stop using styrofoam.

Author: Do we have an owner for this spaceship?

Susan: We all own the planet.

Author: Everybody? Do you really think people in South Africa, Iraq, and China own the planet?

Several students: Yes, yes.

Author: If nobody owns it, what would be our mission? Or do we have a mission?

Rory: To keep it alive.

Jennifer: To stop polluting. Stop having wars.

Author: Do you think we have enough food for our journey?

Susan: The planet has enough food, but it needs people to help it. It needs people to help it because people pollute it.

Author: Good. Did you find it interesting to think of the planet Earth as a spaceship?

Several students: Yes.

Mark: The spaceship looks like the ship on Star Trek.

Author: Can anyone think of a different comparison? A different metaphor to make people take care of the Earth? Like, I know of an artists' sketch where he drew an oyster and instead of a pearl inside you see the planet Earth. Because the pearl reminds us of something beautiful, the artist hopes to persuade us to take care of the Earth.

Christine: You could draw the Earth on a ring. Or the Earth on a necklace. People would think it's precious.

Mary: If you broke it, it would be gone. It would be like a family heirloom and you

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Spaceship Earth

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don't want to lose it.

Author: Great! What else could you think of?

Rory: You could put the Earth on a wheelchair with bandages all over it.

Geoffrey: The Earth is round like a clock. You could think of it as a clock running out of time. Get people to stop polluting...

A metaphor is a means of comparing two terms, in this case of understanding and experiencing one kind of experience in terms of another. The "spaceship Earth" metaphor is not merely in the words the students use during instruction — it is in their very concept of Earth. The students are discussing factual scientific concepts by using metaphor — a type of verbal shorthand. The students talk about the planet Earth that way because they conceive of it that way.

Exploring Orientations Through Metaphor

When student look at air and water pollution, plastics in the world's oceans, destruction of the ozone layer or global warming, they are seeing absolutely unprecedented environmental problems for which our old patterns of thinking lack adequate responses. Part of the confusion for most individuals is that the economic and political forces that drive destruction of our natural resources are often treated by governments as though they are all that is significant. But economic and political systems are merely an expression of some types of values, and not necessarily publicly accepted values. In order to address the crisis they face, students must consider all of what counts in measuring the quality of life, especially in the face of scientific uncertainty. In order to understand environmental problems and resource issues, it is essential that students assess the worth of natural systems in light of their spiritual, recreational, and aesthetic qualities as well. Such factors are often trivialized or omitted altogether. Speaking out about these spiritual and ethical values will take courage, whether it is a student in the classroom or a citizen who cares.

Engaging students in a dialogue about values and quality of life is essential to developing a concerned citizenry. One way of exploring environmental values is through the construct of orientations. In this regard, an orientation is defined as a tendency for an individual to understand and experience the world through an interpretive framework embodying a coherent set of beliefs and values. When attempting to understand the natural world, most of our concepts can be organized in terms of one or more orientations: scientific, aesthetic, utilitarian, spiritual, recreational, and political. To see how instructional metaphors can be used to explore such orientations, notice the range of underlying values in the following metaphors for the planet Earth.

- The Earth is a factory.
- The Earth is a community.
- The Earth is a painting.
- The Earth is a garbage dump.
- The Earth is a playground.
- The Earth is a church.
- The Earth is a melting pot.
- The Earth is a highway.
- The Earth is a market place.
- The Earth is our mother.
- The Earth is a symphony orchestra.
- The Earth is a battleground.
- The Earth is a court room.
- The Earth is a living organism.

To see how it is possible for an instructional metaphor to create new meaning, as from a utilitarian or political orientation to a scientific (or ecological) orientation, the "global village" metaphor is discussed in detail.

For many adults of our culture, the planet Earth is increasingly like a powerful spaceship and we are only now learning to be sensitive voyagers. The "spaceship Earth" metaphor is commonly used by biologists to highlight the ecological aspects of the natural environment, and emphasizes the living together that lies behind the concepts of community, system, recycle and survival. This requires the masking of certain aspects of a village or community that are viewed, for example, as "productive" or "leisure" or "political" activities. In fact, the utilitarian or political aspects of the planet are frequently viewed as not serving the planet's interests as an ecological system. The utilitarian or political aspects of the planet are suppressed, since they may be "too costly" or "too destructive" or "too competitive" or "too out-of-balance."

Because the metaphor highlights important planet Earth experiences and makes them coherent while it masks other Earth experiences, the metaphor gives the planet Earth a new meaning. If those things entailed by such a metaphor are for the student the most important aspects of their Earth experiences, then the metaphor can give new meaning to the student's concept of the planet Earth.

These are dangerous times and we take comfort in the fact that such metaphors act as guides for future action in accordance with the metaphor. According to Lakoff and Johnson (1980), if a new metaphorical concept enters a student's conceptual system, it may alter that conceptual system and the perceptions and even actions that system gives rise to.

By exploring metaphors which highlight a range of orientations, it is possible for the students to identify and articulate their own ideas, beliefs, and positions with one another. As a class, their top priority must be to balance the economic, political, environmental, aesthetic, recreational and spiritual values. In this way, students are encouraged to defend their own ideas, have a personal interest in the discussion and focus on the relevant issues. This leads to an appreciation of non-violent methods of communication. Through metaphoric imagery, students can conceptualize, discuss, and begin to understand complex global issues and effectively generate and test possibilities for change and repair. Through metaphor, students can dream about what the world could be like.

Metaphors and Classroom Instruction

When teachers use metaphors they are frequently searching for ways of explaining complex or abstract ideas or of helping the learner to visualize it in such a way that they can examine the implications for themselves. Successful metaphors are often achieved through structuring imagery generated by knowledge-creating scientists and philosophers. For example, the forest is discussed as a "community" which emphasizes the ecological or the living together aspects of the natural environment. The effect of CO_2 in the atmosphere is comparable to the glass of a greenhouse: it lets the warming rays of the sun in but keeps excess heat from radiating into space. The clouds are described as acting "like a blanket" in keeping the Earth warm. Exploring each of these examples is intended to help the learner view a possibly familiar phenomenon in a new way, or to compare an unfamiliar phenomenon to something that is more familiar. In that sense they are acts of persuasion. Part of the teacher's job is to persuade her pupils into ways of looking at things that are now an established part of our intellectual life.

When teachers use metaphors, they need to know when a metaphor works best in moving students from the abstract to the concrete, or for making the strange seem familiar — and vice versa. For example, a "global village" metaphor would allow the students to conceptualize the planet Earth in terms of something they understand readily, namely their own village or community or even school. In this instance, the introduction of the global village metaphor early in the unit would serve as a means of facilitating the students' understanding of a new and abstract set of environmental concepts. When introducing such concepts, "common" metaphors such as "A habitat is a house," "The sun is a factory," "A seagull is a janitor," seem to work well because such metaphors involve fewer interpretations.

At other times, "atypical" metaphors such as the "spaceship Earth" seem to work well in moving students from the concrete to the abstract, or from the familiar to the strange. In this instance, the "spaceship Earth" metaphor was used at the end of the unit to review specific concepts already covered, and to stimulate the students to invent imaginative and novel associations. In this instance, a more ambiguous or multifaceted metaphor may have opened up new ways of understanding the planet that had become familiar.

Clearly, metaphors are important as teaching devices because they allow the transfer of coherent information in a flexible way, thus allowing many entry points and many exit points. Controlled experiments have shown, for example, that the more ambiguity a metaphor provides, the better it serves basic thought processes (Johnson and Malagady, 1980).

It seems likely that the use of instructional metaphors saves the teacher from specifying one by one each of the often innumerable relationships between the instructional metaphor and the concept of interest. Metaphor rescues the students from complicated and boring explanations because the metaphor will always be simpler than the abstract concept it represents. Because the metaphor allows for greater flexibility, the transfer of information is more vivid and memorable.

Effective use of metaphors requires a classroom atmosphere that encourages exploration, mutual respect among students and teachers, a strong tolerance for ambiguity, and respect for different opinions. Some steps to help students explore environmental problems and construct solutions are as follows:

1. Help students understand the metaphor. Have the students verbally make comparisons between the two terms. How is the planet Earth like a spaceship? How is it not like a spaceship?

2. Help students verbally describe the underlying truths, or concepts, that the metaphor brings to mind.

3. Help students explore the meaning of the metaphor with others. The students need to understand that their interpretation of the metaphor is not universally shared and that others

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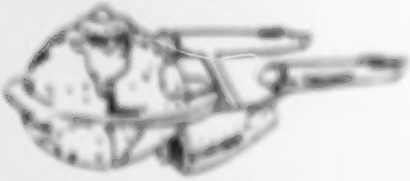


have interpretations of the metaphor profoundly different from their own. Hence, what are the interpretations of the individual students?

4. Help students analyze and appreciate the pungency of metaphors.

5. Make students aware that the metaphor is a metaphor. It is possible to forget the metaphor, but still retain the valid truth, apart from the metaphor.

6. Help students realize that a metaphor can act as a guide for the way they think and behave towards the concept of interest. For example, if the planet Earth is a spaceship, then like any spaceship, its food, air and water are precious and they must use it wisely if they are to survive the journey.

7. Listen to the metaphors that the students spontaneously generate during instruction and attempt to incorporate these into classroom discussions.

8. Provide opportunities to create, with their vivid imaginations, exciting new metaphors for the planet Earth.

Educators need to recognize the role of metaphors in concept formation, and in stimulating interesting and expressive thought. Metaphors encourage students to express feelings, to ask a range of questions, to see things in new light — and thus are useful tools for inquiry (Sutton, 1978, 1980, 1981). Through metaphor, environmental values and ethics can be incorporated into our shared multinational culture, and we can begin to approach global issues with a more holistic environmental ideology. Through metaphor, students can dream about what the world could be like.

Conclusion

To the extent that students recognize their interconnection and interdependence on this planet, they will be less likely to emphasize human differences and political separations. To the extent that students realize their oneness with all other life forms on this planet and all its living systems, they will be more likely to work to maintain the health of the planet. To the extent that students recognize the value of metaphor as a tool for creating new meaning and for persuasion, they will have more reasoning power, and work towards solving global environmental issues.

Through metaphor, students begin to see that this one Earth is a habitat shared by people and other living things, and they begin to see things differently. They remember that it all begins outside. The soil, rivers, clouds, oceans, forests and breezes of this planet connect us to plants, animals, and people all over the Earth — in Iraq, Japan, Canada, China, Brazil, Mexico, Australia, Greenland, Great Britain, Kenya, South Africa — all over, everywhere. Each day they are reminded that the planet is not the domain of one nation, but a "Global Village" of cultural and natural systems. It is a solitary "Spaceship" shared by all living things, each one dependent on the rest for its own survival, and for the survival of the whole.

When the students of today see the planet from the moon, they don't see any divisions of nations, or states, or alliances. This image will function as a metaphor for future generations to create new analytic constructs of their vision of what the world might become. This is the one planet that they will all share, and they will be the future voices of the Earth. ❑

Gloria Snively is a professor at the University of Victoria in Victoria, British Columbia. The author wishes to thank Laura Corrigan for her metaphorical artwork, and Bob Lloyd, teacher at Quadra Island Elementary School for allowing her to teach a metaphors lesson to his grade 6 students.

CLEARING
environmental education in the pacific northwest

OZONE

What Would It Be Like to Live in a World Where the Sun Was Dangerous?

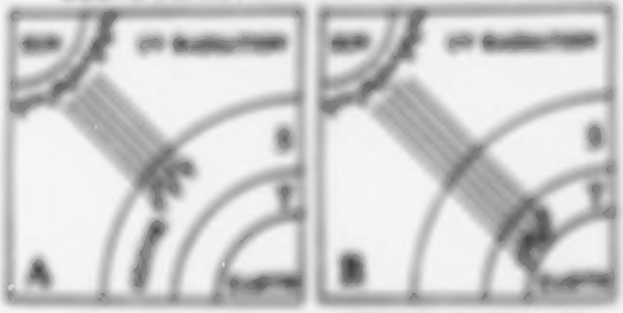
Ozone Depletion: Why Does it Happen? How Will It Affect Us? What Can We Do About It?

What Is the Ozone Layer?

Ozone is a form of oxygen. In the lower atmosphere, oxygen is usually found in [illegible] component of two atoms of oxygen. The molecule, abbreviated as O_2, is the form of oxygen that we need to breathe. Ozone is a [illegible] and [illegible] molecule composed of three oxygen atoms, and is abbreviated O_3.

The ozone layer is found in the stratosphere between 15 and 30 miles above the Earth's surface. Though this layer contains only about one ozone molecule in every 100,000 air molecules, it acts as a protective screen, filtering out the sun's harmful ultraviolet (UV) rays. Life on Earth as we know it could not have developed without this screen, and life as we know it cannot continue if it is destroyed.

OZONE DEPLETION: BEFORE AND AFTER



WITH OZONE LAYER   WITHOUT OZONE LAYER

T = TROPOSPHERE S = STRATOSPHERE

In Diagram A, UV radiation from the Sun is filtered out by the ozone layer. In Diagram B, the UV radiation is not filtered, and reaches Earth at dangerous levels.

Isn't Ozone Harmful? Why Do Cities Sometimes Have Ozone Alerts?

In addition to the stratospheric ozone layer, ozone also is found in the layer of the atmosphere closest to the earth, known as the troposphere. While the ozone layer in the stratosphere far above our heads protects us from UV radiation, ozone n the troposphere is harmful to people and damages crops and trees. Tropospheric ozone is formed by the reaction of sunlight with substances such as car exhaust and industrial chemicals and is often referred to as photochemical smog. Ozone in the troposphere provides some protection from UV rays, but its dangers far outweigh its benefits.

What is Damaging the Ozone Layer?

The ozone layer is being attacked by man-made chemical compounds containing chlorine and bromine. The most common of these are chlorofluorocarbons (CFCs) and bromofluorocarbons (halons). Because of their stable chemical structure, these compounds don't break down in the lower atmosphere. They take five to ten years to reach the stratosphere, where they are broken down by intense UV radiation. This breakdown releases atoms of chlorine (from CFCs) or bromine (from halons) that react with and destroy ozone. Each of these atoms is able to react repeatedly and destroy as many as 100,000 ozone molecules.

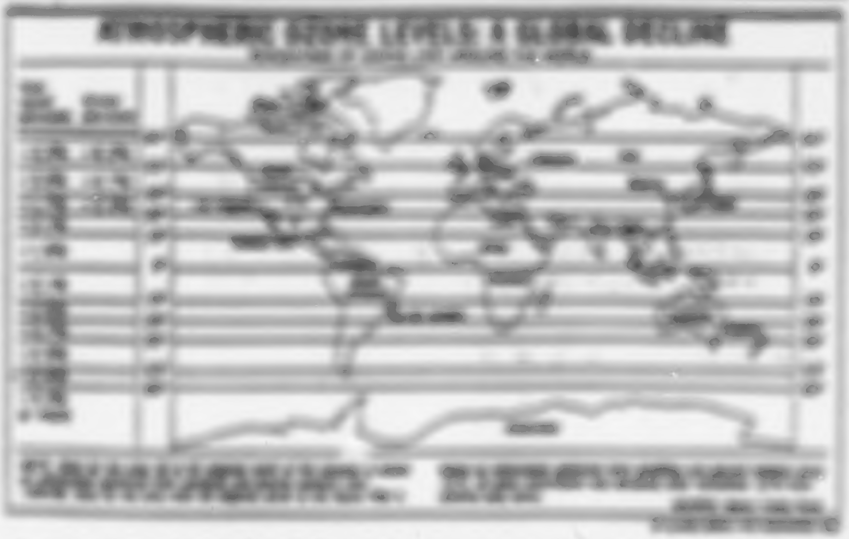
What Evidence Is There That Ozone Depletion Is Occurring?

Since 1985, scientists have been studying the ozone "hole" that forms every year over the south pole during the Antarctic spring. The size and duration of the hole continue to increase, opening earlier and closing later each year, exposing an area larger than the United States to dangerously high levels of UV radiation. The edges of this hole have extended over southern Australia and southern Chile.

In 1991 a team of U.N. scientists found that not only is the ozone layer thinning over middle latitudes in both the northern and southern hemispheres, but that depletion is now also occurring in summer. Up to this point, depletion had been recorded only during the colder winter months. Depletion over the United States now averages 3.5% in summer and reaches 4.5% in the winter, extending into early June. More ominously, ozone thinning has been measured over Northern Europe, including a 20% loss of ozone recorded over Scandinavia in January, 1991.

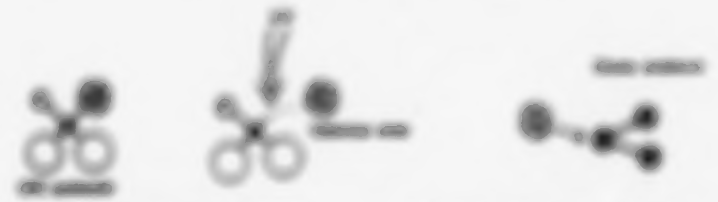
The most recent data on ozone loss is perhaps the gravest news yet, though. On February 3, 1992, NASA released a report showing extremely high levels of ozone depleting chlorine in the atmosphere over most of the northern U.S., Canada, and northern

continued on page 12



Source: Ozone Trends Panel, National Aeronautics and Space Administration, as published in The Washington Post, March 6, 1988, p. A8

How Ozone Is Destroyed



In the upper atmosphere UV light breaks off a chlorine atom from a CFC molecule.

The chlorine atom attacks an ozone molecule breaking it apart and so destroying the ozone.

Chlorine monoxide
Free oxygen atom
Oxygen molecule

This forms an ordinary oxygen molecule and a chlorine monoxide molecule.

Then a free oxygen atom breaks up the chlorine monoxide.

The chlorine is free to repeat the process of destroying more ozone molecules.

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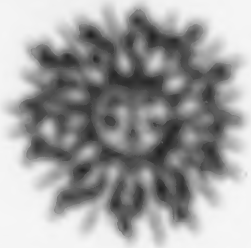
OZONE

continued from page 113



Europe and Asia. Depending on weather conditions, this chlorine could cause temporary ozone loss of as much as 20% to 40% over these areas by the end of this winter, and during any given season in the next several years. The same press release reported ozone loss of up to 15% over tropical latitudes, including much of Hawaii, possibly related to the cloud of sulfate particles from the eruption of Mt. Pinatubo.

At present, predictions for future ozone depletion over the remainder of the decade vary. On the conservative end, some scientists predict another 3% loss by the year 2000. Others predict a further decline of 10%. The British scientist who discovered the Antarctic ozone hole recently stated that, "we should not be surprised if we are talking about a 20% to 30% ozone depletion by 2000" over the United Kingdom and Northern Europe. This project has been echoed by Dr. Sherwood Rowland, the scientist who, in 1974, first suggested that CFCs were destroying the ozone layer. It should be noted that the predictions up to this point on which we have based our policy decisions have consistently underestimated the true extent of the ozone problem.

Can the Ozone Layer Repair Itself?

Ozone is constantly being created and destroyed in the stratosphere. The average life of an ozone molecule is relatively short, but until recently ozone was being created at least as fast as it was being destroyed. Unfortunately, the chlorine and bromine we have released into the atmosphere have reversed this, and they are destroying ozone faster than it can be created. After emissions of these chemicals cease, the ozone layer will eventually repair itself. However, recent estimates indicate that even if we stopped all CFC emissions today, depletion would continue to worsen for 15 to 20 years before any repair could begin, and that the Antarctic ozone hole would not fully repair itself until the late 21st century.

What Can Be Done About the Ozone Layer?

Depletion of the ozone layer is a problem that is global in scope. It stands to affect all people in all parts of the world. Solving the ozone problem requires action and cooperation from world organizations, nations, state and local governments, industry and people like you.

HOW WILL OZONE DEPLETION AFFECT US?

Life on Earth developed under the protective shield of the ozone layer, and has been sustained by this protection for nearly a billion years. Depletion of this shield will be harmful both to humans and other living things on which we are dependent. Dangers from elevated levels of UV radiation include the following:

Human Health Problems

- Increased Incidence of Skin Cancer -- According to the Environmental Protection Agency (EPA), [illegible]

- Increased Incidence of Cataracts, the Leading Cause of Blindness in the U.S. -- [illegible]

- Weakening of the Immune System -- [illegible]

- Premature Wrinkling, Toughening and Aging of the Skin

Damage to Crops and other Land Plants

- Reduced Crop Yields and Stunted Growth of Natural Vegetation -- [illegible]

Threats to Marine Life

- Disruption of the Marine Food Chain and Further Reduction of Already Dwindling Fisheries -- [illegible]

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What Is Our Government Doing?

The U.S. is one of close to 70 nations that signed the Montreal Protocol on Substances the Deplete the Ozone Layer. This 1987 U.N. treaty called for a 50% reduction (from 1986 levels) in CRC production and a freeze on the production of halons. Due to subsequent evidence that these provisions were inadequate, another summit was held in London in 1990. There it was agreed to CFCs and halons will be phased out completely by 2000, while methyl chloroform and carbon tetrachloride will be eliminated by 2005 and 2000 respectively. The 1990 revisions of the Clean Air Act call for a similar phase-out schedule, while also providing some regulation in areas not covered by the Protocol.

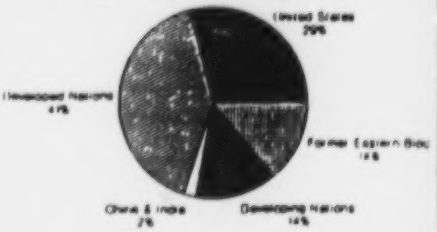
During 1991, Australia, New Zealand, Canada, Sweden, Norway, Finland, Austria, Switzerland and the nations of the European community all set phase-out targets several years ahead of those called for by the London agreement. Faced with continuing reports of increasing ozone loss, and pressure from environmental groups and the scientific community, on February 11, 1992, the U.S. government announced that the phase-out schedule for CFCs would be accelerated to end production by the end of 1995.

This was an important step, and should be applauded. However, it should be noted that this shift in the timetable only applies to CFCs, and does not include other ozone depleting chemicals. Additionally, this date is still several years away, and in the meantime ther are many other stpes that can be taken to prevent unnecessary emissions of these chemicals. As was mentioned earlier, many companies are finding ozone-safe substitutes and switching ove to them in advance of the dates required by law. Several state governments have also taken action. Hawaii was the first state in the nation to mandate recovery and recycling of CFCs used in car air conditioners and ban over-the-counter sales of the chemicals. Other states such as Vermont, Oregon, Florida, Maine and Minnesota followed suit.

Resources

The issue of ozone depletion is usually treated as part of the overall climate change and global warming issue. Resources specifically about ozone depletion are uncommon. There are many resource materials available on global warming, which include information and activities about ozone depletion.

WORLD CFC PRODUCTION AND USE



Global Warming and the Greenhouse Effect
(Middle School) Teacher guide with student material. From: GEMS, Lawrence Hall of Science, University of California, Berkeley, CA 94270. Cost $11.00 plus $1.50 shipping and handling.

Global Warming: High School Science Activities
(High School)
Twenty-one activities in biology, chemistry, physics, earth science and science, technology and society. Published in 1991 by the Climate Protection Institute, a project of the Earth Island Institute, San Francisco, CA.

Greenhouse Effect and Climate Change
(Middle School) Also, draft form of 9-12 materials available now from Christie Shannon, Science Education Center, Lawrence Livermore National Laboratory, Livermore, CA . Phone (415) 373-0778). Cost: free.

Secondary Science Curriculum Modules for Global Change Education
(Middle School), High School) Modules will address emerging issues of global change. Five multi-activity modules for high school and a similar set for junior high are currently being developed. Available Spring 1991 from Rosanne Fortner/ Victor Mayer, School of Natural Resources, Ohio State University, 2021 Coffey Road, Columbus, OH 43210.

Global Transparency Kit
A collection of 39 full-color overhead transparencies that provide a concise overview of major global environmental issues and their relationships to the global economy. It has relevant lesson plans for teachers, a reource guide, a scientific glossary and discussion topics. Cost is $149.95 US. For more information, contact Dr. Peter Nelson at (206) 722-1471. ☐

Ozone Depletion

Grade level: 5-9

Subject: Earth and Life Science

Concept: 1. Shorter wavelengths of light such as ultraviolet can harm living organisms.

2. The ozone layer protects living organisms from dangerous doses of ultraviolet radiation.

Course Goal: Students can demonstrate the destructive properties of UV light and demonstrate protection from the ozone in the stratosphere.

Time Required: Experiment observations may be spread over several days.

Materials Required: Triangular prisms, grow light, black light, sheet of plexiglass, month-old bean and corn plants, black plastic.

Action:

1. Begin by growing plants in the classroom. The plants should be sprouted a month before you plan to conduct the activity.

2. Inform yourself about safety practices with black light. Use the black plastic to shroud the experiment to shield the classroom from UV light.

3. Explain,that there are ways to break sunlight into different wavelengths. Ask students if they know of ways that light rays can be broken up.

4. Divide students into cooperative lab groups. Pass out a triangular prism to each group. Using the light beam from a slide or filmstrip projector, demonstrate how light can be separated into different wavelengths. If there is sufficient sunlight, have students use the prisms outside and experiment with separating white light.

Explain that different colors of light in the spectrum represent different wavelengths of light on both ends of the spectrum that we are not able to see. Explain that the shorter wavelengths of light are called ultraviolet and we cannot see that light. the lengths that are longer than red are also invisible and are infrared.

Introduce ultraviolet light and show students the black light. Explain that this light gives off ultraviolet light. Exercise appropriate safety precautions when using the UV light.

Set up three plant stations. Each station should have 2-3 plants. Explain to students that they are going to test to see if different kinds of light affect how plants grow. Ask each lab group to make predictions about the experiment.

Each group should have their own chart and then transfer results to large butcher paper.

Discuss observations. There should be an observable difference between plants grown under grow light and the black light. The plexiglass should protect the plants from the UV light.

Show students an illustration of the stratosphere depicting stratosphere, troposphere and the ozone layer. Share information with students about the role of ozone and how it protects the Earth from the ultraviolet light. Relate the plexiglass to the ozone layer.

After students have been given information about ozone layer, assess how students apply their observations about the bean plant experiments to ozone layer.

	Station 1 Time Grow Light	Station 2 Black Light	Station 3 BlackLight (sheet of plexiglass between light and plastic)
10 min	________	________	________
1 hour	________	________	________
Day 2	________	________	________
Day 3	________	________	________

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Top Picks for an Environmental Reference Shelf

State of the ENVIRONMENT
DIRECTORY OF STATE ENVIRONMENTAL AGENCIES
State of the World

by Bob Graef
Paragon Publications

At first glance, it's easy to lump all environmental studies books into one category. At second glance, that all-embracing category comes unglued, showing a pattern of cracks and seams. And understanding the natural sub-divisions that lie on opposite sides of the seams becomes especially important when time comes to allocate scarce dollars to learning resources.

It is every bit as important to us at Paragon Books. If we're to maintain our credibility among school people, we'd better offer some understanding of how different environmental resources might plug into your programs. We don't pretend to understand everyone's program, but we do recognize that educational resources fall into rough categories. Though we could split them finer, let's break them down into ten basic subdivisions:

1. **Reference and data books.**
2. **Teacher-learner guides**
3. **Focus on conservation issues**
4. **Focus on crises**
5. **Opposing viewpoints**
6. **Personal action guides**
7. **Nature study**
8. **Field guides**
9. **K-4 selections including stories and fables.**
10. **Essays and editorial writings.**

We'll begin with the first two categories, but with the one proviso that for the purpose of this article, our picks will be most appropriate for high school classrooms. We'll limit our list to twelve top titles which will deliver the biggest bang for your buck, the most dense concentration of usable reference material, and a core for any grade 9-12 environmental collection for library or classroom.

Environmental Law in a Nutshell. Findley and Farber; revised 1990; West Publishing Company; $13.50 paperback.

West Publishing specializes in law school books. Their Nutshell series is to law what Masterplots is to literature, offering readable synopses of rulings on every type of domestic environmental problems. The topical index, actually more of a directory, ensures easy referencing. 365 pages.

1992 Information Please Environmental Almanac. Compiled by the World Resources Institute; Houghton-Mifflin, 1992; $9.95 paperback.

An honest attempt at putting all the most-asked-for quantitative comparisons into one affordable volume. Its theme is comparisons; comparative rankings, by state, city, nation and continent. Data is presented on food, energy, water, wastes, forests, wetlands, pollution, green cities, global warming, and national profiles.

Plenty of bar charts, pie charts, and coded maps supplement the text. Maybe a better title would have been Encyclopedia of Current Environmental Information. 606 pages.

Field Guide to Wildlife Habitats of the Western United States. Benyus, Janine M.; Fireside, 1989; $14.95 paperback.

Here is an example of the new revolution in field guides. Whereas traditional field guides are species-specific, Benyus' guide focuses on habitats, pursuing the question, "How do living and non-living components of habitats conspire to make habitat ecologies unique?"

Readers find much more than species identification; how to observe, geological and ecological histories, essays, and more. This author's approach delivers a consistent message of respect for the wild world. 336 pages.

Saving the Earth, A Citizen's Guide to Environmental Action. Steger, Will and Jon Bowermaster; Knopf, 1990; $19.95.

An inspirational source of information and teaching ideas. If this had come out in hardcover, it would doubtless be the favorite environmental studies text today. The graphics alone, each of which can provide the core for a lesson series are illustrative of the excellence of Saving the Earth for school use. 306 pages.

The Global Ecology Handbook. Global Tomorrow Coalition; 1990; $16.95.

Subtitled "What You Can Do About the Environmental Crisis." If the content seems familiar, it is because this one is a text supplement to the PBS series, Race to Save the Planet. Basically, it is a how-to book. Readers describe it as a well-balanced guide for discussion, debate, and action on the full range of environmental issues. 414 pages.

Guide to the Management of Hazardous Waste. Haun, William J.; Fulcrum, 1991; $34.95

Fulcrum has answered the need for a layman's reader on hazardous waste problems. What constitutes hazardous waste? What are the health issues? What are the methods of proper disposal? What are the rights of businessmen? What about their liabilities, risks, and regulation?

Readers will discover the complex of laws governing hazardous waste problems and get an appreciation for the problems of responsible waste management. (They'll also discover that due to the nature of the content, this is challenging reading.) 212 pages.

State of the World, 1993. Brown, Lester R. et al; Norton, 1992; $10.95

Each year, Worldwatch Institute's platoon of editors readjusts its focus onto the most important issues of the year. Their mission is to keep the public's finger on our planet's pulse and to educate us as to how our living conditions are changing.

An indication of the importance of State of the World is its distribution in 23 languages. It has become a standard reference for UN departments, national governments, and high school and college classes. 256 pages.

Toxics A-Z. Harte, Jon, et al; University of California, 1991; $34.95

Finally, a pharmacology of bad stuff. We usually picture toxics being approached by technicians in moon suites, but with this volume, we can systematically approach them all with our minds. Find out how to identify them, protect yourself, and minimize risk.

Through the chemistry of toxics pops up here and there, the writing has been engineered to appeal to as broad an audience as possible. A whopper of an index permits efficient key-word searches. Don't bother looking for better coverage on this topic. Toxics A-Z has no serious competition. 479 pages.

The Earth Care Annual, 1993. National Wildlife Federation, 1992; $22.95

Earth Care Annual is an excellent companion for State of the World. The difference is that Earth Care Annual draws its text from recognized authorities who have written significant pieces for periodicals or journals in the past year. You'll see credits given to Audubon, Christian Science Monitor, Discover, Time, National Wildlife, and dozens of others. Since articles from most of their sources employ journalistic slam-bang there-you-have-it style, don't expect the challenge or depth found in Scientific American. 237 pages.

Energy Alternatives. Bender, David L., et al; Greenhaven Press, 1991; $16.95.

The title suggests a collection of information on alternative technologies. Not so. Like most of Greenhaven's books, this is a debater's source book. Respected thinkers from each side of many energy issues have their say. So rather than getting bogged down in technical detail, readers are treated to opposing viewpoints. The approach leads to better citizenship which might then lead to better engineering. 176 pages.

Environment. Bender, David L., et al; Greenhaven Press, 1990.

This generic title needs some explaining: Here we have a big, thick, handsome book of authoritative opinion on many major environmental issues. In keeping with Greenhaven's tradition, one hundred contributors with divergent views all have their say. Imagine Aldo Leopold and Dixie Lee Ray in the same volume!

A number of schools have picked up class-sets of this one after failing to find suitable texts. As a sourcebook, it is among the best, but as it does not offer a range of educational activities, it falls short of what many expect in a good textbook. Still, no other book offers such a wealth of even-handed treatment of environmental controversies. 426 pages plus addenda.

Conservation Directory, 1993. National Wildlife Federation, 1992; $18.00

In one volume you have the phone number and address of seemingly every public agency, group, foundation, or institute that has anything to do with the environment. Each organization's purpose is clearly stated. 398 pages.

Making right buying decisions is tough, especially when faced with a dizzying and ever-changing array of titles. And since whatever resources you make available to your students will profoundly influence the direction and outcome of your program, those choices are critically important.

The twelve titles are among today's best, which means we should keep our eyes open for newcomers. By the time this article is printed, one of the twelve will likely have gone out of print while other fantastically great new titles will have been freshly released.

Unlike Gone with the Wind, none of these titles will stay in publication long. Changing perceptions, changing technology, and environmental gains and losses will render them obsolete. then consider what book promotions can do to stocks of popular titles. When an articulate author becomes the darling of talk-show hosts, it only takes a little air-time for that author to oversell existing stocks of their book and they'll be gone with the wind.

Next time we'll deal with top picks from other categories with the grade-level focus moving to middle school and junior high.

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Top 20 Computer-Aided Environmental Education Resources

This list represents what I feel are the twenty best computer-aided environmental education resources currently available. It covers the state-of-the-art in laser videodiscs, CD-ROM, distance learning, computer courseware, and Hypercard stacks.

It is not a comprehensive listing. I've only listed the very best resources that I've experienced firsthand. Each annotation includes a general description, basic system requirements (i.e. mac or DOS), recommended age level, retail price, and contact information. Write or call the distributors for more detailed information.

If you know of other high quality resources that you feel should be added to this listing, please send that information to:

W.J. "Rocky" Rohwedder, Ph.D
Department of Environmental Studies and Planning
Sonoma State University
1801 E. Cotati Avenue
Rohnert Park, CA 94928
(707) 664-2249

LASER VIDEODISCS

Our Environment

Our Environment provides a single source for 11,000 color visuals, captions, maps, diagrams and film sequences concerning environmental problems facing modern society. The disc has four broad sections: global overviews of physical and human geography; human impacts on air, water, land and organisms; environmental problems (including acid rain, species extinction, soil erosion); and a visual glossary which defines and illustrates over a thousand concepts and terms. Recommended ages: 10 and up. Disc Cost: $225 Hypercard Stack: $70 Teacher manual: $20 Student manual: $10.

Videodiscovery Inc.
1515 Dexter Ave. N., Suite 400
Seattle, WA 98109 **1-800-548-3472**

Interactive NOVA: Race to Save the Planet and Animal Pathfinders

The Interactive NOVE series creates a complete educational experience by combining the NOVA science show on videodisc with some excellent HyperCard-based software. Race to Save the Planet addresses the complex concepts of global ecology and also offers special action projects for students. Animal Pathfinders brings fascinating animals and their habitat into the classroom. Both utilize outstanding footage from the NOVA videos. Runs on the Macintosh with a hard drive.

Recommended ages: 10 and up. Cost: $395

Scholastic Software Inc.
2931 East McCarty Street
Jefferson, MO 65102 **(800) 541-5513**

The Living Textbook: Wetlands

This is the first in a new series from Optical Data's field trip produce line. It includes more than 1,200 slides and 50 minutes of video on wetlands, their importance, and the wildlife found in them. The disc features regional field trips to wetlands around the U.S. Barcoded lesson plans offer interdisciplinary investigations based on the disc. Recommended ages: 10 and up. Cost $395

Optical Data Corporation
30 Technology Drive
Warren, NJ 07060-9990 **(800) 524-2481**

CD ROM

National Geographic's STV Integrated Science: Rainforest

The Science TV (STV) series covers a variety of topics, including the Rainforest. Based on National Geographic films, video clips, photographs, magazine and book excerpts, this disc and Hypercard stack provides a unique view of this environment and the forces that endanger it. Recommended ages: 10 and up. Cost: $265

Videodiscovery, Inc.
1700 Westlake Ave., N. Suite 600
Seattle, WA 98109 (206) 285-5400

Ecodisc

Ecodisc is a multilingual simulation of a real nature reserve in which the user is free to explore and experiment. Aimed mainly at ecology students age 14-18, Ecodisc encourages problem-solving and learning at the individual's pace. The languages are English, Spanish, French, German, Dutch, Danish, Norwegian, Swedish, and Italian. Cost: $250

Educorp
531 Stevens Ave., Suite B
Solana Beach, CA 92075   (800) 843-9497

Down to Earth! and GAIA: Environmental Resources

These are two CD-ROM catalogs of visual images for presentations and publishing. Down to Earth! contains over 600 high-resolution color and monochrome PICT images devoted to environmental themes, including endangered species, flora, fauna, foliage, food, landscapes, and marine life. GAIA: Environmental Resources contains over 400 high resolution 24-bit color pictures of nature scenes in PICT and TIFF formats. Recommended ages Adult. Cost: $249 each.

Wayzata Technology, Inc.
PO Box 87
Prior Lake, MN 55372   (800) 735-7321

DISTANCE LEARNING

Global Laboratory Project

The Global Laboratory involves secondary teachers and students, college faculty, and scientists in the use of computer-based communication to undertake studies that will be of scientific interest and will therefore contribute to better understanding of global environmental problems. Students are involved in measurement, modeling, data analysis and experimentation activities on a variety of topics. Recommended ages: 15 and up. Cost: Varies.

Technical Education Research Centers (TERC)
2067 Massachusetts Avenue
Cambridge, MA 02140   (617) 547-04430

Global Rivers Environmental Education Network (GREEN)

GREEN is an international network of schools involved in an interactive water quality monitoring program for high school students and their teachers. Students in various watersheds around the world are sharing their data and experiences through the utilization of the GREEN handbook and computer network (which operates on EcoNet). Recommended ages: high school and up. Cost: varies.

GREEN
School of Natural Resources
University of Michigan
Ann Arbor, MI 48109

National Geographic Kids Network

A telecommunications-based science and geography project, the Kids Network links students from all over the U.S. to share data and ideas on a particular topic (such as acid rain, water, weather, and waste) via electronic mail during a six week period. The project has a wonderful graphic interface, however it is currently limited to classrooms with the Apple IIGS hardware. Teacher's Guide and Student Workbooks are included. Recommended age: grades 4-6. Cost: varies.

Kids network
National Geographic Society Educational Services
Department 101
Washington, D.C. 20077-9966   (800) 368-2728

COMPUTER COURSEWARE

National Geographic Society Computer Courseware

The National Geographic Society has been a leader in computer-aided environmental education. Courseware includes software, filmstrip, student booklets, and a Teacher's Guide with activity sheets. They have several offerings, including: Project Classify: Plants and Mammals; Project Zoo; and The Weather Machine. Designed for Apple II computers this courseware is colorful, graphic and easy to use.

National Geographic Society
Educational Services
Washington, D.C. 20036   1-800-368-2728

Earthquest and Earthquest Explores Ecology

Earthquest is an amazing stack with four "windows" to explore: natural systems, the human journey, the environment and fragile ecosystems, and continents of the world. Earthquest Explores Ecology features an EcoExplorer to explore Earth's major ecosystems, an Ecosimulator to investigate cause-effect relationships, a Rainforest Explorer, and a Renegade Tour where a bunch of renegade vegetables hope to save Planet "Whatamess." Interdisciplinary in orientation and full of great graphics and sound, these wonderful programs show the amazing capabilities of HyperCard. They require a Macintosh with a hard drive. Recommended ages: 10 and up. cost: $59.95 each.

Earthquest
125 University Avenue
Berkeley, CA 94301   (415) 321-5838

Eco-Adventures in the Rainforest and Eco-Adventures in the Ocean

In these programs, participants journey into an environment with a specific ecological assignment. The goal is to survive the journey and complete your assignment while you race against the clock. Both programs are highly educational, fun and have great graphics and sound. Recommended ages: 10 and up. Cost: $79.95 each.

Chariot Software
3659 India Street
San Diego, CA 92103   (619) 298-0202

Audubon Wildlife Adventures

Audubon Wildlife Adventures focuses on wildlife conservation issues. Current releases include grizzly bears and whales. Sharks and "poacher patrol" are under development. The series features up-to-date scientific information, nice graphics, data bases and on-line guide books. The supporting guidebooks include instructions question and answers, activities and worksheets. Computer requirement: any Apple II or DOS machine with at least 128K of RAM. Recommended ages: 8-17. Cost: $50-60 (depending on your hardware). Additional $30 for School Edition which includes the materials mentioned above.

Advanced Ideas Inc.
2902 San Pablo Avenue
Berkeley, CA 94702 (415) 526-9100

SimEarth
The Living Planet

SimEarth

This simulation game is a caricature of planetary ecosystems. The goal is to modify, manage and nurture a planet from creation, through the formation of life, to the development of technology. Once your planet is established you can watch and manipulate the influence of various factors. This company also wrote SimCity, a simulation game with the same flavor but based on urban systems. Both a Mac and PC version available. Recommended ages: 12 and up. Cost: $69.95

Broderbund Software Inc.
17 Paul Drive
San Rafael, CA 94903-2101
800-521-6263

Decisions, Decisions: The Environment

This program puts students in charge of a town that's addressing crucial environmental issues such as landfills, water pollution, recycling, and waste disposal. The decision-making encourages the integration of ecology, political science and economics. The whole class or teams of students can play. A Teacher's Guide is included which contains activities, experiments, and lesson plans. Macintosh and DOS versions available. Recommended ages: 10 and up. Cost: $120

Tom Snyder Productions
90 Sherman Street
Cambridge, MA 02140 (617) 876-4433

HYPERCARD STACKS

Fishbanks, Ltd.

Fishbanks is a simulation that teaches principles for the sustainable management of renewable resources. It focuses on the variables involved in the control of population levels of fisheries. It's available in both Macintosh and DOS formats and includes a complete teacher's kit. Recommended ages: High school and up. Cost: $100.

Professor Dennis Meadows
Institute for Policy and Social Science Research
Hood House, University of New Hampshire
Durham, NH 03824

Interactive Energy Education Curriculum Library

This interactive database is an annotated collection of over 100 energy education materials. With a click of the "mouse" on the appropriate graphic symbol, users can search the database for materials in a specific grade level (K-3, 4-6, etc) or a specific discipline (math, biology, chemistry, etc.) Annotations include information on content, price, and availability. Requires a Macintosh with hard drive and the HyperCard program. I'm biased on this one because I helped to develop it! Recommended ages: It's for teachers. Cost: $12 (includes postage and handling).

Energy Education Curriculum Database
Energy Center — Sonoma State University
Department of Environmental Studies and Planning
1801 E. Cotati Avenue
Rohnert Park, CA 94928 (707) 664-2577

Knowledge Tree on Global Climate Change

This is an information and retrieval system that provides students or teachers with a data base for the study of global climate variations caused by the human-induced greenhouse effect. This program was developed in cooperation with the Center for Science and Engineering Education at the Lawrence Berkeley Laboratory. Recommended ages: 15 and up. Cost: $15.

Climate Protection Institute
5833 Balmoral Drive
Oakland, CA 94619 (415) 531-0100

Global Warming: Impacts and Solutions

A group of volunteer computer experts from Apple Computer Inc. has developed a stack focusing on the problem of global warming, its potential impacts, and mitigation strategies. The goal of the program is to graphically illustrate the perils of global warming and to highlight the role of energy efficiency and renewable energy in reducing the threat. The program is divided into three sections: *How Global Warming Can Affect Our Lives; The Science of Global Warming;* and *What We Can Do About Global Warming.* Requires a Mac and Hypercard 1.2 or higher. Recommended ages: 12 and up. Cost: $10.

EcoNet
3228 Sacramento St.
San Francisco, CA 94115 (415) 923-0900

Kids Can Save the Earth

Nearly 100 children show their love and concern for the earth in Kids Can Save the Earth, an 18 stack set. The set features original artwork and essays from children across the U.S., along with practical information about what we can do to help. Stacks are full of animation, sound and special effects. It's got a nice "homegrown" feeling. Recommended ages: 10 and up. Cost: $15. You can also download these stacks from some computer bulletin boards.

Berkeley Mac Users Group
1442A Walnut Street, #62
Berkeley, CA 94709 (415) 849-9114

For more information on this field, you may wish to obtain "Computer-Aided Environmental Education," edited by W.J. "Rocky" Rohwedder and published by the North American Association for Environmental Education. 150 pages. $15 postage paid ($12 for members). Send a check or money order to:

NAAEE
PO Box 400
Troy, OH 45373 (513) 339-6835.

Exemplary E.E. Programs
in the Pacific Northwest

Students involved in habitat restoration on the Upper Palouse plant native vegetation, including Choke cherry and Ponderosa pine, on abandoned farmlands to prevent erosion.

Cheney High School: The Upper Palouse Habitat Restoration Project

by Thomas [illegible]
Cheney High School

The upper Palouse habitat restoration project (UPHRP) was designed to help students learn the principles of environmental stewardship. Stewardship is encouraged by incorporating the principals of ecology and the activities of habitat restoration into the high school biology curriculum at Cheney High School. By teaching biology in this way, we have started to move away from a textbook centered curriculum to one that focuses on cooperative learning and outcome-based education. This style of teaching lets students become active participants in their own education and develop for the land that they help to restore.

The UPHRP is a collaborative project, involving federal, state and county resource agencies, along with elementary and junior high schools within the Cheney School District and Eastern Washington University. The focus of the UPHRP is to involve students in the science of ecosystem protection/restoration and the biological and ecological activities that accompany this work.

The restoration projects currently underway by Cheney High School are divided into two categories. 1) upland habitat restoration targeting agricultural land that is no longer in cultivation. The students design habitat plots and plant native trees, shrubs, grasses, and forbs that are indigenous to the northern Palouse area of eastern Washington State. Students also follow up on their restoration work by documentation of plant mortality, plant growth rates to establish a baseline computer data base. Since the start of the project in 1991, our students have restored four former agricultural sites and have planted in excess of 2,000 shrubs and trees. 2) The second focus of the project involves riparian enhancement, protection and restoration. In conjunction with a local community coalition, we have adopted a nearby stream into the Adopt a Stream Program. The activities undertaken on this portion of the project include conducting biological surveys and restoring portions of Marshall Creek. Since the project was initiated last spring we have conducted stream surveys on over a mile of Marshall Creek. Surveys involve the measurement and description of stream channel characteristics, an estimation of fish and aquatic invertebrate populations, and water chemistry. We are also restoring stream banks of Marshall Creek by planting native shrubs and trees.

Support for this project has come from the Washington Department of Wildlife, Soil Conservation Service, U.S. Fish and Wildlife Service, and the Spokane County conservation district. Our students area also collaborating with students from the Biology Department of Eastern Washington University. In addition to the above projects, we are planning a native plant nursery. We have recently received a grant from the Washington Department of Wildlife to construct and stock the nursery on site at the high school. This nursery will provide plant materials for our restoration work, and teach plant biology and propagation techniques to our students.

An outdoor environmental education classroom is currently being planned for a site near Cheney Junior High School. Students from both the junior high and high school, along with the university and school district

Exemplary E.E. Programs — in the Pacific Northwest

support personnel, will design and construct the EEC. One of the objectives of this site will be to provide easy access to a variety of habitats. The site will contain grassland, wetland, shrub-steppe, and forest habitats. The plant materials for this site will be obtained from the native plants nursery at the high school.

We are also planning to develop a network of area high school biology teachers and their students to exchange ideas on environmental curriculum, and to collaborate on field restoration projects. The main idea of this networking is to expand the idea of habitat restoration activities to other schools and to focus on sharing ideas between teachers and field data exchange and direct interaction between the students.

We are also developing a regional environmental science research competition. This competition will be patterned after a similar science research program developed at the University of Alaska-Fairbanks. Students within our region will have the opportunity to develop and conduct an environmental science research project and then present their findings to a panel of judges selected from university, professional, public and private organizations. The top two students will receive a one-year tuition and room and board scholarships to Eastern Washington University. By developing this regional research competition, we hope to increase the awareness of environmental education and the research activities associated with it.

Thomas [illegible] is a biologist and educator teaching for the Cheney School District. He teaches biology at Cheney High School in Cheney, Washington, which is located 16 miles south of Spokane. He holds a BA in Education and a BS and MS in biology from Eastern Washington University.

Cheney High School students work with biology and education majors at Eastern Washington University to rehabilitate Marshall Creek, a stream that was damaged by cattle grazing.

Surf's Up

A Global Warming Simulation

1. Provide each team of 4-5 students with the following:
- one plastic pan (12"x12" x 3" deep)
- 10 toothpicks
- a packet of modeling clay

You, the teacher, will have
- a bottle of blue food coloring
- a tray of ice cubes.

2. Using the clay, have students create a variety of "continents". Some should have tall mountains while others would be like "lowlands" (quite flat). In at least two continents, students can use their fingers to make small bowls or "lakes" that will hold water.

3. Have students pour colored water into the pan, making sure no continent is totally covered. Mark the level of the water on the clay islands with toothpicks.

4. Students should put clear water into the two lakes, which should be above the water level in the pan. Remove some of the colored water if necessary.

5. Each student should get about 8 pieces of ice and stack them on top of a flat area. Set their pan in a place where it can remain undisturbed for about 20-30 minutes.

6. Meanwhile, have students answer the following questions:
   - *What do you think each of these is supposed to represent in the "real world": pan, colored water, uncolored water, ice cubes.*
   - *Write down a prediction, telling what you think may happen as the ice melts.*

7. After 20-30 minutes, have students check on their pans, discuss observations with their team and answer the following questions:
   - *List at least 4 observations. You may use words and drawings.*
   - *Now explain in your own words, in paragraph form, what happened in the experiment. (Include information about changes in the level of the colored water, if the uncolored water changed, how different shapes of the continents caused differences in the amount of water which rose over it after the ice melted, etc.)*
   - *How does this experiment show what might happen as a result of global warming? (Paragraph form)*

8. Clean up the experiment.

Teaching for Nature: Filling the Need for Natural History in Experiential Education

by Thomas L. Fleischner
Prescott College
and
Saul Weisberg
North Cascades Institute

Most people define themselves by staring into the looking glass of humanity. This tends to lead to an overly narrow view of our world, and of ourselves. Educators often acknowledge the importance of the cultural, ethnic, and physical diversity of humans, but frequently ignore the rich diversity inherent in the rest of the natural world. We believe that the greatest teachers are the many creatures and inanimate beings out there whose images do not reflect in our human mirror. Current estimates of biological diversity on this planet range from five to thirty million species (Wilson 1988). We are but one of these, and there is no limit to what we can learn from the Others, whom Loren Eiseley (1969) called "hidden teachers." We encourage all educators to actively pursue ways to learn directly from nature itself.

Outdoor and adventure education often uses nature as an obstacle, a tool for learning about our own strengths and weaknesses — as in the challenge of a rockclimb or the surge of rapids on a swift river. This is a good beginning, but it does not go nearly far enough. Discovering the ways of Others, we learn about ourselves as well. In taking nature out of the background and placing our outdoor activities in the context of nature's ways, we learn that the world is richer and deeper than we imagined. This facilitates not only personal growth, but leads us to activism and greater commitment to global change.

Over the past decade we have been working to develop effective methods for connecting learners — and teachers — to nature, and building receptivity to the lessons natural history can teach us. We offer the following principles for teaching in, about, and for nature:

1) Nurture curiosity
2) Encourage active observation and direct contact with nature
3) Be still sometimes
4) Feelings and facts are both important
5) Remember who the real teachers are

Modern natural history traces its roots back centuries — to Darwin in the Galapagos, to English parsons chasing butterflies and painting wildflowers, to Aristotle and Linnaeus attempting to make sense of the diversity of nature's larder. Naturalists unraveled the "history of nature" by examining fossils, comparing them with their living counterparts, and drawing conclusions which shook our world. The foundation of natural history across the centuries has been careful observation. Observation leads naturally to description, and then to comparison and identification. Our systems of classifying the natural world — biological taxonomy, classification of rock types — are based on the observations, descriptions, and comparisons of these early naturalists.

Natural history is one way people make sense of the world around them. It asks the most basic questions: What is that? Where am I?, and then proceeds deeper into the questions that connect us with all beings: Who are you? Who am I? How do we fit together in this world?

For a naturalist, there are three steps to reading a landscape: observing, asking questions, and interpreting. Too often, we tend to attempt to interpret without the observation and questioning upon which it is based. Learning from nature requires that we perceive more alertly and deeply. Observation is not passive: insightful seeing and listening are active pursuits. Refining these and other senses takes practice, like rock climbing or kayaking. With all senses open we bring ourselves and our students into close contact with nature.

Description and identification lead to the power of names. With its name, we can communicate about something, whether it be a lupine, a thrush, or a piece of granite. More importantly, we begin to communicate with a fellow being. Knowing one's name shows our respect. It doesn't, of course, have to be the "proper" scientific binomial; it can be a name discovered and used by a group. "Gray-breasted water dragon" can be just as good a descriptor as "American dipper," "water ouzel," or "*Cinclus mexicanus*." Students will be interested to learn, however, how much insight and information can be accessed by learning the "right" name. Natalie Goldberg (1986), in *Writing Down the Bones*, admonishes us to "give things the dignity of their names." In Ursula LeGuin's (1968) *The Wizard of Earthsea*, the apprentice wizard Ged spends years memorizing the "true name" of each being. For only by using a creature's name could the magician's spells call upon it to do his bidding. It is similar for the naturalist, and the outdoor learner. The key to naming is to remember that it is a means, not an end.

The following sample exercises are designed to help us teach for nature in the outdoor classroom. Infinitely adaptable, they can deepen a wide variety of experiential education activities. Remember that the purpose of all these exercises is to tune in more closely to nature, and to have fun in the process.

Exercise #1: Observing Our Ground

This simple exercise helps focus the students' attention, and begins to help them realize how much there is to see once they begin to observe. Students pair up and sit cross-legged about one meter apart. Both take a minute to observe the ground between them. One partner then closes their eyes; the other changes one thing in the meter-wide world between them. (Remove a small leaf, change the position of a twig, add a pebble.) The other partner then opens their eyes and attempts to discover the change. Partners continue to switch roles back and forth. We have found the following rules to be helpful: to start with fairly obvious changes, and get increasingly subtle — remember that the objective is not to fool your partner, but to help them develop keen observational skills; to try to point to the changed spot as soon as you open your eyes — feel the "pull" of the change rather than being analytical about it. We often begin workshops or even semester-long courses with this exercise. Students always seem to enjoy it so much that they must be forced to stop! Generally, five or ten minutes get the point across. After practicing observation skills in this meter-wide world, try to get students to use the newly learned skills to see patterns on a larger, landscape scale. Where do the clusters of conifers dwell on that hillside? Where is the moss growing? Is there a relationship between the two?

Exercise #2: Passing the Stone

Pass an object, such as a stone, around a circle of five to ten people. Whomever is holding the "stone" must speak about it carefully. One person is timekeeper and tells the group to pass on the "stone" after one minute. A few simple

Twenty Questions to Ask Your Toilet

[illegible]

[illegible]

Twenty Questions to ask your toilet

[illegible]

[illegible]

Exemplary E.E. Programs

in the Pacific Northwest

Environmental Education Through Watershed Studies: Budd/Deschutes Project GREEN

[illegible]

[illegible]

[illegible]

Exemplary E.E. Programs

in the Pacific Northwest

[illegible]

Key elements of the 1992-93 [illegible] Project include:

- Water quality monitoring (chemical and biological)
- Interdisciplinary investigations of the watershed
- Computer communications - within the watershed and world wide
- Community service/action projects
- Spring Student Congress

[illegible]

[illegible]

The Rediscovery of North America

by Barry Lopez

[illegible]

A few hours after midnight on the morning of October twelfth in the Julian calendar of the West — or October twenty second, according to the modern Gregorian calendar — Juan Rodriguez Bermeo, a lookout aboard the caravel *Pinta*, spotted the coast of either San Salvador Island or Samana Cay in the Bahamas and shouted his exclamation into the darkness. It was the eighteenth year of the reign of Ferdinand and Isabella of Castile, and these mariners were their emissaries.

Cristoforo Colombo — or Christopher Dove as it would be in English — commander of the fleet of three ships, gave orders to take in sail, and to lay close hauled five miles offshore awaiting the rising sun. The seas were rolling. Strong winds tore at the crests of the waves. A gibbous moon was setting in a clear sky.

As they awaited dawn, Columbus let it be known that he had earlier seen a light on the island, a few hours before midnight. The ships were making about ten knots when Bermeo cried out. By his claim the commander would had to have seen the light at a distance of more than thirty miles over the curve of the Earth. Columbus thereby took for himself the lifetime pension promised the first man to sight land.

Of Señor Bermeo history has little more to say. It was rumored that he converted to Islam and died fighting alongside the Moors, who had that year of 1492 lost their final stronghold in Spain. In the same year Jews were evicted from the country by royal edict.

We do not know what Columbus and his men envisioned when they came ashore on Samana Cay or San Salvador, the island the local Arawak people called Guanahani, in a chain the Spanish were to call the Lucayas. But we know that in those first few hours a process began we now call an incursion. In the name of distant and abstract powers, the Spanish began an appropriation of place, a seizure of its people, its elements, whatever could be carried off.

What followed for decades upon this discovery were the acts of criminals — murder, rape, theft, kidnapping, vandalism, child molestation, acts of cruelty, torture and humiliation. Bartolome de las Casas, who arrived in Hispaniola in 1502 and later became a priest, was an eyewitness to what he called "the obdurate and dreadful temper" of the Spanish, which "extended [their] unlimited and close-fisted avarice," their vicious search for wealth. One day, in front of Las Casas, the Spanish dismembered, beheaded, or raped three thousand people. "Such inhumanities and barbarisms were committed in my sight," he says, "as no age can parallel...." The Spanish cut off the legs of children who ran from them. They poured people full of boiling soap

The Rediscovery of North America

by Barry Lopez

(continued)

They made bets as to who, with one sweep of his sword, could cut a person in half. They loosed dogs that "devoured an Indian like a hog, at first sight, in less than a moment." They used nursing infants for dog food.

It was "a continuous recreational slaughter," practiced by men who felt slights to their personages, imagined insults to their religion, or felt thwarted in their search for gold or sexual congress.

These words of Las Casas's — who said "I resolve silently to pass over, lest I should terrify the reader with the horror," a more graphic recounting of these incidents — were written at Valencia in 1542 at the request of historians, "to display to the world the enormities, etc., [that] the Spaniards committed in America to their eternal ignominy." Las Casas writes in the opening pages of this treatise, "I earnestly beg and desire all men to be persuaded that this summary was not published upon any private design, sinister ends or affection in favor of or prejudice of any particular nation, but for the public emolument and advantage of all true Christians and moral men throughout the world."

I single out these episodes of depravity not so much to indict the Spanish as to make two points. First, this incursion, this harmful road into the "New World," quickly became a ruthless, angry search for wealth. It set a tone in the Americas. The quest for personal possessions was to be, from the outset, a series of raids, irresponsible and criminal, a spree, in which an end to it — the slaves, the timber, the pearls, the furs, the precious ores, and later, arable land, coal, oil, and iron ore — was never visible, in which an end to it had no meaning.

The assumption of an imperial right conferred by God, sanctioned by the state, and enforced by a military; the assumption of unquestioned superiority over a resident people, based not on morality but on race and cultural comparison — or, let me say it plainly, on ignorance, on a fundamental illiteracy — the assumption that one is due wealth in North America, reverberates in the journals of people on the Oregon Trail, in the public speeches of nineteenth-century industrialists, and in twentieth-century politics. You can hear it today in the rhetoric of timber barons in my home state of Oregon, standing before the last of the old-growth forest, irritated that anyone is saying "enough.... it is enough."

What Columbus began, then, what Pizarro and Cortes and Coronado perpetuated, is not isolated in the past. We see a continuance in the present of this brutal, avaricious behavior, a profound abuse of the place during the course of centuries of demand for material wealth. We need only look for verification at the acid-burned forests of New Hampshire, at the cauterized soil of Iowa, or at the collapse of the San Joaquin Valley into caverns emptied of their fossil waters.

> *"A sense of place must include, at the very least, knowledge of what is inviolate about the relationship between a people and the place they occupy, and certainly, too, how the destruction of this relationship, or the failure to attend to it, wounds people."*

The second point I wish to make is that this violent corruption needn't define us. Looking back on the Spanish incursion, we can take the measure of the horror and assert that we will not be bound by it. We can say, yes, this happened, and we are ashamed. We repudiate the greed. We recognize and condemn the evil. And we see how the harm has been perpetuated. But, five hundred years later, we intend to mean something else in the world.

In Spanish, la querencia refers to a place on the ground where one feels secure, a place from which one's strength of character is drawn. It comes from the verb querer, to desire, but this verb also carries the sense of accepting a challenge, as in a game.

In Spain, querencia is most often used to describe the spot in a bullring where a wounded bull goes to gather himself, the place he returns to after his painful encounters with the picadors and the banderilleros. It is unfortunate that the word is compromised in this way, for the idea itself is quite beautiful — a place in which we know exactly who we are. The place from which we speak our deepest beliefs. Querencia conveys more than "hearth." And it carries this sense of being challenged — in the case of a bullfight, by something lethal, which one may want no part of.

I would like to take this word querencia beyond its ordinary meaning and suggest that it applies to our challenge in the modern world, that our search for a querencia is both a response to threat and a desire to find out who we are. And the discovery of a querencia, I believe, hinges on the perfection of a sense of place.

A sense of place must include, at the very least, knowledge of what is inviolate about the relationship between a people and the place they occupy, and certainly, too, how the destruction of this relationship, or the failure to attend to it, wounds people. Living in North America and trying to develop a philosophy of place — a recognition of the spiritual and psychological dimensions of geography — inevitably brings us back to our beginnings here, to the Spanish incursion. The Spanish experience was to amass wealth and go home. Those of us who have stayed, who delight in the litanies of this landscape and who can imagine no deeper pleasure than the fullness of our residency here, look with horror on the survival of that imperial framework in North America — the physical destruction of a local landscape to increase the wealth of people who don't live there, or to supply materials to buyers in distant places who will never know the destruction that process leaves behind.

If, in a philosophy of place, we examine our love of the land — I do not mean a romantic love, but the love Edward Wilson calls biophilia, love of what is alive, and the physical context in which it lives, which we call "the hollow" or "the canebrake" or "the woody draw" or "the canyon" — if, in measuring our loss, we feel anger. I think we have a further obligation. It is to develop a hard and focused anger at what continues to be done to the land not so that people can survive, but so that relatively few people can amass wealth.

I am aware that those words, or words like them, have historically invoked revolution. But I ask myself, where is the man or woman, standing before lifeless porpoises strangled and bloated in a beach-cast driftnet, or standing on farmland ankle deep in soil gone to flour dust, or flying over the Cascade Mountains and seeing the clear cuts stretching for forty miles, the sunbaked earth, the streams running with mud, who does not want to say, "Forgive me thou bleeding earth, that I am meek and gentle with these butchers?"

If we ask ourselves what has heightened our sense of loss in North America, what has made us feel around in the dark for a place where we might take a stand, we would have to answer that it is the particulars of what is now called the environmental crisis. Acid rain. Soil erosion. Times Beach. Falling populations of wild animals. Clearcutting. Three Mile Island. But what we really face, I think, is something much larger, something that goes back to Guanahani and what Columbus decided to do, that series of acts — theft, rape, and murder — of which the environmental crisis is symptomatic. What we face is a crisis of culture, a crisis of character. Five hundred years after the Niña, the Pinta, and the Santa Maria sailed into the Bahamas, we are asking ourselves what has been the price of the assumptions those ships carried, particularly about the primacy of material wealth.

One of our deepest frustrations as a culture, I think, must be that we have made so extensive an investment in running the continent, created such an infrastructure of nearly endless jobs predicated on the removal and distribution of trees, water, minerals, fish, plants, and oil, that we cannot imagine stopping. In the part of the country where I live, thousands of men are now asking themselves what jobs they will have — for they can see the handwriting on the wall — when they are told they cannot cut down the last

VOICES OF THE SALMON PEOPLE

The voices of the peoples are not heard and if heard are not heeded. The voices of the forest, trees, landscapes, Salmon and Owl, are not heard, and if heard are not heeded. Kim Stafford, in his book Entering the Grove (Peregrine Smith, 1990) remembered as a child that Daniel Boone was told that you could hear the forest "calling your name." The literal child within us listens for the voice and hears the forest: the whispering tree leaves, rustling grasses, bird songs, insect buzzes. Kim Stafford tries to interpret the voices for us and seeks to understand the possible messages contained in the voice. Gary Braasch, through his photographs in Entering the Grove, tries to capture the spirit in visual form. He translates the call — the voice — in a form our eyes might read and interpret. Kim Stafford closes with "I stared deeper into the green thicket, trying by my life's compound eye to know another way of seeing."[1]

Perhaps what meaning there might be is to be found in our response, our attempt to dialog with the voice. What follows now are the voices of the Salmon People.[2] Listen for the response of the people to the voice as it calls their names. The Salmon people are in dialog with the Salmon. This dialog is so old that the meanings have entered their culture and their religion. Listen to how they are duty-bound to honor the Creator for the gift of Salmon, the gift of Life, by acknowledging their obligation to preserve and protect the Salmon.

"We have our religion that was preserved for us by our elders, our way of life and with our religion we were taught that our salmon and our meat and our roots and berries are gifts from the Creator himself, that he blessed us that way. And it's with our religion that we have to take care of them, let Him know how much they mean to us, what He's done for us. It's our way of life...totally."

—Margaret Palmer, Yakima

"We have to carry on our traditions, our religion, in worshipping and protecting and praying for those Salmon, carry on our services, so that those salmon will come back. That's our responsibility to these salmon. In order for them to come back, we have to maintain our culture, and remember where we come from."

— Don Sampson, Umatilla

"The Salmon is the giver of life to the Indian people...gives us strength...and it gives us strength to get to the other world. That's how important Salmon is."

— Louie Dick, Umatilla

"...our people exercised their way of taking the resources and using them for their livelihood, for survival...through generations and generations, for thousands of years...our body and blood flowed together and life was provided by the resources to continue living. For generations we have carried (these) teachings, for thousands of years, a way of life and a livelihood. We are those descendants, have lived those teachings and we still hear the words of our forefathers, their voices clear in our minds."

— *Johnson Meninick, grandson of Chief Meninick, Yakima*

"So we are transformed by the magic of the land, and as we in turn transform it, may we learn to transcend the boundaries of state and nation whenever necessary to keep the fabric whole. May we say with one voice, mindful of the Haida Indian guide (to Newton Chittenden during his exploration of the Queen Charlotte Islands in 1884) "This land is our home, it is all mountains, forests, and water—it sustains us and it is ours to protect."

...The sum of our individual knowledge of this place creates a network of caring that can protect the whole landscape, if we are listening to one another."[3]

Let these voices be clear in our minds, let us listen to one another, and to the voices that call our names.

— BG

[1] Entering the Grove, by Kim Stafford and Gary Braasch, Peregrine Smith Publications, 1990.

[2] "My Strength is From the Fish" Video by the Columbia River Inter-tribal Fish Commission, 1992.

[3] The Northwest, Pacific Coast and Cascades, Bruce Brown and Gary Braasch, Rizzoli Intl., 1990.

The Rediscovery of North America

by Barry Lopez

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few trees and that what little replanting they've done will not produce enough timber soon enough to ensure their jobs.

The frustration of these men, who are my neighbors, is a frustration I am not deeply sympathetic to — their employers have behaved like tourists and they have known for years that this was coming. But in another way I am sympathetic, for these men are trying to live out an American nightmare which our systems of schools and our voices of government never told them was ill-founded. 'There is not the raw material in the woods, or beyond, to make all of us rich.' And in striving for it, we will only make ourselves, all of us, poor.

When people have railed against environmentalism for the restrictions it has sought to impose, they have charged — I'm thinking of loggers in Oregon, and shrimp fishermen in the Gulf, and oil drillers on the North Slope — that environmentalists are out to destroy the independent spirit of the American entrepreneur. They're meant to evoke an image of self-reliance and personal responsibility. They're meant by their words to convey that: If something is truly wrong here, we'll see it and fix it. We don't need anyone to tell us what to do.

The deep and tragic confusion here is that this pose of responsibility, this harkening to a heritage of extolled independence, has no historical foundation in America. Outside of single individuals and a few small groups that attended to the responsibilities of living on the land, attended to the reciprocities involved, the history of the use of the American landscape has been lawless exploitation. When an industry asks to police itself, we must have the courage to note that there is no precedent, that the unremarked precedent, from the time of the Spanish, is lawlessness in the quest for wealth, with the extension of enough local generosity to keep from being run out of town, enough respect for institutions to keep from being hauled before the bar, and enough patriotism to be given the benefit of the doubt by society.

We cannot, with Huck Finn and Mark Twain, light out for the territory any more, to a place where we might continue to live without personal restraint. We need to find our home. We need to find a place where we take on the responsibilities of adults in the human community. Having seen what is going on around us, we need to find, each person, his or her courage, and to believe it is not a monster or a bully we face, a rigged game, but an assailable beast, another in our history like Tamerlane or the Black Death.

What we need to discover is the continent again. We need to see the land with a less acquisitive frame of mind. We need to explore in it again, to discover the limitations of cooperation with it. We need to discover the difference between the kind of independence that is a desire to be responsible to no one but the self — the independence of the adolescent — and the independence that means the assumption of responsibility in society, the independence of people who no longer need to be supervised. We need to be more discerning about the sources of wealth. And we need to find within ourselves, and nurture, a profound courtesy, an unalloyed honesty.

Some hold that this task is hopeless, that the desire for power and wealth is too strong. Without denying in any way the dark flaws in human nature, I wish politely to disagree. I would like to put forth what may pass for sources of hope but which are in fact only examples that we can follow, situations that we can take advantage of, and people who I think might inspire us.

If we are looking for some better way to farm, we need look no further than the Amish and Mennonite communities of the country for that kind of intelligence. And we should remind ourselves that it is not necessary to be a people in order to avail ourselves of their intelligence — that in fact such a task is unwise.

If we are to find examples on which to model our courage, we need look no further than Bartolomé de las Casas, who wrote 450 years ago what is relevant to us today. And if we are afraid of human angels, we need only remind ourselves that Las Casas was, to some others, also a man of his day. He paid little attention to the plight of black slaves in the New World.

If we would search for a contemporary hero, fighting still the beast the Spanish loosed on these shores, we need only turn our eyes to El Salvador and the murdered archbishop Oscar Romero.

If we require heroes closer to home, people who in their own writing, in their essays and meditations, have given us good prescriptions for behavior, we need as a country look no further than the work of Wendell Berry or Thomas Merton.

If we feel wisdom itself is lost, we need only enter a library. We will find there the records of hundreds of men and women who believed in a world larger than the one defined in each generation by human failing. We will find literature, which teaches us again and again how to imagine.

If we become the prisoners of our own minds, if we think ourselves into despair, we can step onto wounded ground with a shovel and begin to plant trees. They will grow. They will hold the soil, provide shelter for birds, warm someone's home after we are gone.

If we lose faith in ourselves, we can in those moments forget ourselves and dwell on the future of the larger community, on the blessing of neighbors. Your neighbors are those you can see when you look out your window, but today these are not our only neighbors, if we mean by that word a common burden, a common joy in an abstract terrain.

If I think back on that long night when the caravels rolled in heavy seas off the coast of Guanahani, the waning moon setting, the wind blowing hard beneath a clear sky, I can easily imagine men of conscience lying there awaiting the dawn. They could not have known — for they were the first there — what was ahead of them, neither the wonder of it nor how their stories would be tested.

In a sense we lie there with them. It is our privilege to know what the landscape is actually like — its people, its animals. But we are like them, I think, because we can feel ourselves on the verge of something vague but extraordinary. Something big is in the wind, and we feel it. And we feel, with them, the weight of Columbus's authority, his compelling political and ecclesiastical power. And we sense our own reluctance, our lack of objection, before it. The man, however dead or innocent, is forceful. Even if we see him as a man flawed like other men — his megalomania and delusions, his unmistakable longing for noble titles — we are inclined to see that he got us across the literally uncharted ocean, and that that takes a kind of genius. It puts us, somehow, in his debt. It leaves room to forgive him, even to believe in his worthiness. If that search of his for gold should produce a holocaust, we say to ourselves, well, then, we ought take only a little, something for our children, a poor wife waiting at home. And be done with the man. Who can fight the conviction that is in Columbus? Who can deny his destiny? Life is short. Let someone in authority take them to task.

We lie in the ships with these men, I think, because we are ambivalent about what to do. We do not know whether to confront this era of troubles or to stand away, care for our own, and take comfort in the belief that the power to act lies elsewhere.

It is this paralysis in the face of *Caesar*, this fear before the forest, that would cause someone looking from the outside to say that we face a crisis of character. It is not a crisis of policy or of law or of administration. We cannot turn to institutions, to environmental groups, or to government. If we rise in the night, sleepless, to stand at the ship's rail and gaze at the New World under the arriving moon, we know we are thousands of miles from home, and that if we mean to make this a true home, we have a monumental adjustment to make, and only our companions on the ship to look to.

We must turn to each other, and swear that this is possible.

This essay is excerpted from The Rediscovery of North America by Barry Lopez, recently published in its entirety in paperback by Vintage Books in [illegible] *form. Copyright 1991 by Barry Holstun Lopez and used with permission.*

Statement of Vision Toward the Next 500 Years from the Gathering of Native Writers, Artists and Wisdom Keepers at Taos, October 14-18, 1992

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The Endangered Species Act and a Deeper Look at Extinction

by John F. Borowski
Dayton High School

The reauthorization of the Endangered Species Act may become the most contentious ecological debate ever waged. The polarization of the Spotted Owl saga has contributed to the confusion surrounding the biodiversity issue. As environmental educators, we owe it to our students to depict this all important topic with long term solutions in mind.

Edward O. Wilson calls extinction of species the "folly our descendants are least likely to forgive us." It is imperative to recognize that our planet is experiencing an "extinction spasm," not seen in over 65 million years. Before we examine the ESA, we should scrutinize the biological dilemma of extinction.

Extinction is obviously a natural process, with speciation replacing the lost storehouse of genetic diversity. Since fossil records have been taken (up to 600 million years), 5 massive extinction periods have occurred. The Permian extinction (250 million years ago) saw the "loss" of over 90% of all marine species. Historical extinctions of this magnitude were created by climate shifts, possibly volcanic and meteorite episodes. These periods were followed by several million years of evolution and speciation, restoring the planet's diversity. Yet today, with an extinction rate up to 10,000 times greater than past epochs prior to human intervention, society may be losing 27,000 species a year! [illegible] Wilson estimates that one million species are at risk of extinction by the end of this century alone!

Today the problem is habitat loss, especially in biologically rich areas in the tropical forests. While the average person shows an up-swell for the "cuddly mega-fauna" such as the Panda, Elephant and Harp Seal, we should be focusing as greatly on the some 20,000 endangered plants throughout the world.

The potential for undermining the productivity of major ecosystems is upon us. Some scientists, like Paul Ehrlich, argue that population growth is our greatest ecological menace. Yet I offer that the loss of species to extinction is most catastrophic. We cannot recreate "lost" species and the process of evolution is painstakingly slow and future generations would need millenniums of speciation to occur before a semblance of "normalcy" would return.

Before I suggest some activities, I offer this last section as a basis for further study. Let's call it "Why Save Species?"

1. Each living species contains a library of genetic information. The loss of a mouse species with its 100,000 genes and billions of nucleotide pairs, is equivalent to losing a library of biological wealth. We may be losing over 75 different species a day!

2. With the possibility of some 10-80 million species on this planet, what rewards are we losing to extinction:

- There are 80,000 edible species of plants (we only use 12 species to feed 80% of the planet). What "miracle foods" are we losing?
- 20,000 plant species are endangered, yet some of our most vital medicinal discoveries (quinine, aspirin), [illegible] medicines have been extracted from plants. From the Rosey Periwinkle to the Yew tree, to the lowly Penicillium mold, nature offers a drug store of humanity. Sadly, we have only screened 5.7% of all plants for medicinal products.
- Industrial products ranging from oil substitutes, pigments, clothing fibers and building materials are extracted from renewable sources: wildlife.

3. Species are a source of aesthetic wonder and beauty. I cannot imagine the Pacific Northwest without eagles, Africa without herds of elephants and Florida without panthers.

4. Here in the United States we need a strengthened Endangered Species Act. The Act, created in 1973, did have an original focus on ecosystems and this point must be stressed.

PLEASE REMEMBER THE FOLLOWING MYTHS ABOUT THE ESA:

- The ESA blocks economic development. Overall the impact has been minimal. From 1979-1991, 120,000 projects were reviewed by the US Fish and Wildlife Service; only 34 were blocked.

- The ESA has been a failure. To the contrary, dozens of species from the California Condor to the Gray Whale are recovering due to this federal protection.

• Species protection can only damage the economy. This is obviously where we need to stress the economic rewards of healthy fauna and flora. Multi-billion dollar industries such as the salmon fisheries, plant-derived pharmaceuticals and parks and wilderness are a "tax backbone" of our economy.

We must stress the linkage of protected priority habitats. The Endangered Species Act could maximize this. Some 3,000 additional species may be considered for listing! California alone may have 220 animal and 600 plant species ready for listing. So what to do?

• First, identify areas of high biodiversity. The Nature Conservancy has been working to construct a 50 state natural heritage database. Scientist Michael Scott has done this in Idaho and is said to be constructing Oregon at the present.

• Second, protect as many large blocks of diversity, preferably contiguous blocks, as possible.

• Last, build or create greenways, shelterbelts, land bridges and landscape corridors.

EXERCISE #1: [illegible]

Have your students organize a round table debate. I suggest that you bring in several speakers. The Audubon Society and Wilderness Society have excellent data and speakers. Bring in timber representatives and the Northwest Forest Council; possibly you can bring in a "fiscal capitalism" standard. Ask the students to construct a series of questions that investigate both sides of the issue.

EXERCISE #2: Ask the Politicians

Write each congressperson and Senator from your state. Ask their opinion of the ESA and ask them to be detailed and thorough. A class letter could be sent with a priority statement that students want a detailed response and if the Congressperson represents your school's district.

EXERCISE #3: Research Project

I've assigned this project for the last ten years, and it has been a source of great enjoyment for my students ... after the initial grumbling!

I put over 100 endangered species in a hat and the students pick two organisms each.

Say the student picked the Bald Eagle and the Everglades Kite (an endangered raptor). They research the following: biological name, biological description, habitat needs, territory, problems facing the species, programs for restoration, interest groups, laws and future outlook.

The key here is to provide addresses of organizations (federal, state and private) that can provide data. The National Wildlife Federation puts out a wonderful directory that is a must for every ecology classroom. The results are amazing. My students have received data from every state and the nations of Japan, England, Kenya and Canada.

The second part of the project is to author a comprehensive essay on the topic, "Why is Wildlife Essential to Human Survival?" Have the students combine scientific data with their heartfelt views.

And finally, with very motivated classes, I've assigned an interest area to be investigated (like spotted owl, African hunting, whaling). The students pick and write they feel strongly about investigating.

These are a few examples of how we can bring to the forefront the issue of extinction and the Endangered Species Act. Back in 1981, as a novice naturalist teaching at an outdoor center in North Carolina, I chose to teach about endangered species. I couldn't come up with any earthshaking activities besides poems and creative poems representing this issue. Yet the kids were just as excited. We must continue to alert our students to this dilemma, yet more importantly, we must present solutions and concrete action steps of involvement. Even my hero, Edward O. Wilson, argues that "knowing species will generate a love for the species." He struck a chord. When that prolific and respected scientist emotionally reinforced the urgent need for education, I recognized that all environmental educators need to bring their classrooms to life with facts on these issues. Maybe we all can breathe some hope for species.

If I can help supplement your databank on endangered species and the Endangered Species Act, please feel free to contact me at Clayton High School, [illegible] St., Clayton, [illegible] or [illegible].

SUGGESTED REFERENCE MATERIALS FOR ENDANGERED SPECIES

- State of the World 1993, World Watch Institute
- Biodiversity, E. O. Wilson
- A Wealth of Wild Species and the Sinking Ark, Norman Myers
- Extinction, Paul Ehrlich
- 1993 National Wildlife Federation [illegible]

[illegible]

Changing Environmental Behavior

[illegible]

[illegible]

Repairing the Earth: A Call for Restoration Education

[illegible]

[illegible]

Integrating In-Class Incubators into the Marine Education Curriculum

[illegible]

[illegible]

Marine Education Activity

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

Living with Gaia

[illegible]

[illegible]

Rethinking Recycling: Why Teach About Garbage?

Back to the Basics, the Good old basic skills: readin', 'ritin' and 'rithmetic. Remember when education was easy? No lists of outcomes, no electives, no "interdisciplinary" instruction? And then, somewhere in the '60's (or was it really the '70's? or even the '50's?) someone started reforming education. First it was relevance. Then it was competencies. Team Teaching. Modular classrooms. Year round school. The list of "reforms" kept getting longer and longer. Now, in Oregon, there is the Schools for the 21st Century movement. More reform, only this time, it's bigger than ever. The latest reform tries to take the best of everything and put it all into our school system. Longer school years, cross discipline classes, teaching to identified outcomes, preparing students to be citizens in a new millennium. And then they say "Teach Recycling." Do you ever feel like shouting "stop the world, I want to get off"? Instead, it might be easier to understand how it all fits together.

Let's start with outcomes. The overall structural principle in most educational reform programs is to look at what we hope students will know and do as a result of the time they spend in school. Perhaps the best way to identify the necessary outcomes of education is to begin by looking at the world in which students will live and the knowledge, skills and competencies every individual will need in order to survive in that world. According to the AMERICA 2000 report that outlined national education goals in 1991, the skills necessary for success in the world of the future include competency in a wide range of subject matter including English, mathematics, science, history and geography; the ability to use the mind well (critical thinking, problem solving, lifelong learning); skills to exercise the rights and responsibilities of citizenship; and the skills necessary to productive employment in a changing, global economy. According to a summary report for the Oregon Educational Act for the 21st Century (also known as HB 3565 or the Katz Bill) "All of our people, not just a few, must be able to think for a living, adapt to changing environments, and to understand the world around them." Outcomes that allow us to live and let live. Outcomes like being able to evaluate a solid waste landfill siting proposal and make recommendations regarding its approval.

In a 1991 forecast of trends shaping the world of the 21st century, Marvin Cetron and Owen Davis (Crystal Globe: The Haves and Have Nots of the New World Order, St. Martins Press, 1991) summarized by the World Future Society in its Futurist Magazine, of 50 significant trends that will affect the world in which today's students will live, many of the critical trends relate to the environment and the technologies that impact the future of the earth itself. In other words, if students are going to successfully live in the world, they need to understand the world itself and the ways that human behavior and decision making can impact that world for better or for worse. In other words, environmental education!

Critical to understanding that environment is a knowledge of the inter-relatedness of the environment and every choice made by participants in the earth's ecosystems. So what does that have to do with garbage? Nature's solution to the garbage problem is to recycle used resources through the water cycle, decomposition, the air cycle, etc., so that finite natural resources are preserved and the earth

Art by [illegible], [illegible] High School, Age 17, From [illegible] Recycling Poster Contest

It's Time
REUSE
REDUCE
RECYCLE

can continue. When humans started making the decisions, some of that natural balance was destroyed. First, piles of garbage were just left behind. As weather patterns and increasing population changed the migration patterns, people started covering or burning their garbage in an effort to decrease its impact on their lives. Now space is running out in many developed nations, and there is no place to put the garbage. Humanity must find a way to eliminate the garbage, and that leads to a new kind of cycle: recycling used resources. That, however, is not the whole solution. Instead, every citizen on earth needs to re-assess the use of resources.

The important thing is not just to teach recycling, but to teach the larger context — how choices about resource use effect the availability of resources. How fewer resources need to be stretched to provide for more people. How one individual's consumer choices can impact the availability of resources. The decisions related to our solid waste are by their very nature interdisciplinary. A pile of garbage provides questions of every kind: scientific, mathematic, social, political economic, aesthetic, industry and consumerism, medical, ethical, communications — there is not a "subject" matter that is not impacted by the garbage! It is this inter-dependence that is the driving force behind educational reform. If students do not see the relevance of any individual topic to the bigger picture than one level, they will not successfully learn about it. Creative teachers could teach all the basics and a whole lot more by teaching about garbage.

1. Teach a Lesson About Garbage and Tie it into Other Subjects

Is this teaching thinking skills, or what? Start, for example, with identifying and looking at the problem. Kids love to look at garbage. Try it. Take a big plastic tarp and dump the garbage can in the middle of your room. See how many subjects you can address using that pile of garbage. The list in the box on this page gives you an idea of the many learning opportunities that are available.

Looking at Garbage — A Through Z

Anthropology?	What can we learn about the culture by looking through the garbage?
Biology?	What happens to organic food waste when it sits in a garbage can for a day... several days... weeks? How might that be different if it was buried in a plastic container and covered with dirt?
Chemistry?	What chemical compounds might we identify in the garbage? What chemical manipulations could be carried out with the garbage? What could students learn from running a few experiments?
Drama?	Have students do the play "The Throwaway Three" which dramatizes the way people have dealt with trash throughout history. Or let students do improvisational acting using the items in the garbage as props or subjects.
English?	Have students write haiku or other poetry about the items in the garbage. Use information related to the garbage in a short story or as the setting for a novel. Write a research paper on one item in the garbage.
Finance?	How much did the materials in the garbage cost? Could they have been recycled to save disposal expenses? Could a new product be produced utilizing the material? Could a new business be created to deal with them? What percentage of the school's budget is represented by the items in the trash? How would eliminating the garbage affect the school's budget for other activities?
Geography?	How far has each item been traveled to [illegible]? What effects does the local geography have on the composition of waste in the garbage can?
Home Economics?	Ask students to determine whether the items in the garbage were the best consumer choices possible. Compare energy costs and purchase costs of each item.
Industrial Arts?	What new products or packages could be produced from the items you found in the garbage? What construction skills would be necessary to [illegible] the material? What construction skills would be necessary to recycle the material?
Journalism?	Have students write a press release explaining what they found in the garbage and making recommendations about its disposal.
Korea?	What items in the garbage were manufactured in Korea? Which of any are made from natural resources of that country? Of any other country?
Latin?	[illegible]
Mathematics?	[illegible] into various kinds of items and calculate percentages for each.
Natural Resources?	Which items in the garbage are still in their natural state? Which have been altered by human activity? Which came from renewable vs. non-renewable natural resources? Which natural resource systems exist because of or could be constructed based on the garbage?
Oregon History?	Where was the first commercial landfill in Oregon? When did Oregonians build the first garbage burner in the state?
Psychology?	Have students take a poll of students, teachers, staff, parents, community members regarding the garbage problem and various solutions. Tabulate the results and prepare charts and graphs to present the information to decision makers.
Quantum Physics?	What happens to garbage when it is compacted? What is the potential energy capacity of the garbage in your room?
Reading?	What reading materials appear in the trash? [illegible]
Science?	[illegible]
Technology?	How could various technologies be used to help solve the garbage problem? Have students invent a new system to reduce or dispose of waste using advanced technology.
U.S. History?	Develop a timeline related to garbage and waste for the United States. [illegible]
Vocational Ag?	Which items in your classroom garbage could be used in a compost heap? Bring a worm bin into your classroom and let students learn about composting organic waste.
Writing?	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Zoology?	Using a compost heap, have students study all the various life forms that contribute to successful compost. Bring in a microscope and help students identify different components of the compost.

Rethinking Recycling...

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From A to E, we've now helped our students pin down the source of the problem. Using your favorite problem-solving model, now lead them in activities to generate alternative solutions.

II. Introduce waste management concepts in other lessons.

III. Use waste management concepts to apply existing concepts.

Take math for example. Do your students ever get bored with the same old story problems about how many trips to the grocery store will it take to bring all the groceries home on a bicycle? Try one like how many garbage cans would be eliminated if the Jones family recycled all of their newspaper, milk jugs, tin cans and aluminum. In fact, let students write their own story problems based on weighing and measuring the materials they recycle at home.

IV. Use Solid Waste to talk about the Environment

Earth Day is coming up. You don't have any lesson plans, but would like to be sure your students remember the importance of the environment to their quality (and maybe quantity) of life. Use solid waste reduction, recycling, disposal, landfilling, energy recovery as a hands-on topic to talk about environmental issues like air pollution, rainforest depletion, groundwater contamination, and natural resource depletion. See how many students really understand the relationship between putting paper in the recycling bin and saving trees.

Summary

Regardless of which every approach you take, always be sure you guide students through all three steps of environmental learning: Awareness of the problems; Knowledge of alternative choices; and Responsible Action — what can we do here and now? Action can include an Individual Decision/Actions Model, a Community Problem-solving approach, or an Issues Analysis model (Choose an issue, Investigate/Analyze the issue, Define the problem, Identify alternative actions, consider the consequences, assess your ability to make a difference, and Do something.

Be sure you teach appropriate life skills. Remember, the goal is to make your students more capable of effective living in the community of the future. Teach appropriate skills including Persuasion, Consumerism, Political Action, Legal Action, Ecomanagement/Physical Action. Start a Green Schools program or an Environmental Club.

Rethinking the Role of Ecology Education

by [illegible]
[illegible] Schools
[illegible], Oregon

Of all the sciences, ecology could best be described as the "citizen science." Ecology and its powerful concepts of interrelationships and interactions best represents the level at which participation by citizens should occur in the public process. With the proper leadership, ecology study and its application in decision-making could provide an excellent opportunity for full participation by young citizens in our schools. It is ironic that the most powerful level of understanding useful to citizens is the big picture, but it is the big picture represented by ecology that is done either poorly or not at all in our schools. In most biology and [illegible] ecology is chapter [illegible], or exploratory experiences with the outdoors are limited to the sixth grade outdoor school, or only fourth graders study ponds.

Unlike living communities, which are greater than the sum of their parts because of the interactions among the parts, many of our science education programs deal only with the parts. They fail to provide the key to the

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experiences and learning guidance that allow citizens to see connections. Thus, students are left with fragmented information: large mammals in second grade, rocks in fifth grade, weather in sixth grade. And ecology, the science committed to understanding the interactions of whole systems, is for the most part absent from our public education design. Although topics from ecology may come up, they are generally disconnected from larger questions, including local decision making about such matters as land use, water quality and demographics. Knowledge about food webs, predators and [illegible] in populations is seldom used to begin an open-ended science adventure. Scientific knowledge often becomes an end unto itself. Ironically, as new problem solving curricula are developed, the power of science as a problem solving method, when tied to relevant [illegible], is [illegible] in our schools.

> *"The infusion model, as demonstrated by environmental education history, has limited potential."*

Lewis Thomas summed up eloquently the kind of science we need in the schools in his book Late Night Thoughts on Listening to Mahler's Ninth Symphony:

"Teach ecology early on. Let it be understood that the earth's life is a system of interliving, interdependent creatures, and that we do not understand at all how it works. The world's environment, from the oxygen of the atmosphere [illegible] to the [illegible] of the oceans, have [illegible] into an almost unbelievably improbable state of regulated balance since life began, and the regulation of stability and balance is accomplished solely by the life itself, like the internal environment of an immense organism, and we do not know how that one works, even less what it means. Teach that."

But we have not yet chosen to do what Thomas proposes. As the Sustainable Biosphere Initiative states, "Ecologically literate citizens should know not only the key concepts and principles of ecology, but also the basic processes by which ecological knowledge is acquired and the ways in which science and culture interact."

The need for such education, I believe, is part of a larger need. Even though most schools have as their ultimate goal continued development of citizens, that is often seen as an end result of school, while school itself is viewed as a place where young members of our society train to become citizens, practice for later participation in the adult world. The critical citizen characteristics that develop with active participation are stunted by this concept of education as getting ready for the next step, whether it is the next course, the next grade, or graduation. As with our fading industrial world, we have looked at the school as a product-based institution in which students are training for citizenship.

By accepting students as citizens upon their arrival at school and providing opportunities for their active participation in society we could begin to address the agenda set out by [illegible]. I propose that we begin to do so by creating "Ecology Centers" that take for their mission the Principles for Excellence in Ecology Education for children: A Framework for Excellence [illegible]. The essential principle will be "Students should learn the science of ecology by doing it." The centers would organize their development around an ecological inquiry that represented the [illegible] concepts of ecology. The centers should provide focus and preparation for young citizens to become active members of their society. They would be involved in study and projects that [illegible] to this end, their kind of development.

We have taken the idea for establishing such a center to Oregon's [illegible] School District, and we have been pleased at the level [illegible] of work young citizens can [illegible] when it is meaningful and they [illegible] their work is going to be used. Based at the Coastal Studies and Technology Center, our project has the goal of conducting studies in the local setting. Students are currently doing [illegible] studies using a [illegible] monitoring station. Plankton studies are being conducted in cooperation with the National Marine Fisheries [illegible]. Bird and photographic studies have been done, and students have set up a

Ecology for Educators: A Way of Life

Educators for the most part do not have a well-developed ecological framework. They were trained and schooled in the same technique most people use to study elephants. In many elementary schools 70% of the "science" time is spent on large mammals. Few high school programs have a plan that is designed to link the various subjects, many of which are driven by historical curricula and books written by someone a long way away. Educators need opportunities through well designed staff development programs that will inspire them, give them holistic concepts, and personal experience in the study of ecology. Our records show that it doesn't take much personal involvement for an educator to get inspired. A couple of days helping fish and wildlife staff do bald eagle surveys, working with a [illegible] ecologist, or learning procedures at the mouth of the Columbia River does a lot towards bringing that experience to the classroom and having a better understanding of how to provide experiences like that for their students.

[illegible]

Rethinking Ecology Education...

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science to provide live plantings in related schools.

High school students were trained in the center to serve as program leaders in a three day "ECO [illegible]" program for 6th graders at an outdoor camp using an ecological approach to outdoor study. Awareness of ecology [illegible] and the idea of creating a small pond on the campus of a local elementary school. A recent study of a state park by a 5th grade class, focusing on [illegible] recommendations and suggestions brought about a number of changes that will enhance other children's visits to the park. Students became aware through their own actions of the role they can play in the public process and how they can help protect resources. A local ecologist and planner worked with the students in preparing for this project and the on site survey. The ecological approach seems to become authentic experience for the student study projects that link them to their community as citizens.

With a school or district ecology center in place, student projects in the community emerge from an ecological setting that provides the framework. Establishing "ecology centers" brings participation through all the grades. It increases student involvement and brings together subjects that have been disconnected. Current science education in chemistry, physical science, and biology continues to perpetuate the myth that the least skilled learners of all are able to link those subjects together into a meaningful whole. Ecology has the greatest potential as a foundational organizer for science programs. The [illegible] model, as demonstrated by [illegible] science education [illegible], has limited potential.

Establishing "ecology centers" will allow specialists to stop being givers of information, a technique that, for many learners, may be the least effective learning [illegible]. This approach incorporates "learning by doing" and "teaching others," levels of learning that research indicates in the 75 to 90% retention rate, far above the 5 to 10% rate associated with telling and reading apart from actual experience.

As painful as it is, we must keep in mind that all of the people in our culture who have made decisions that have degraded our life support systems, caused potential global changes, reduced the sustainability of earth processes, and caused [illegible] ecological diversity to be significantly reduced, have gone through our classes at one level or another.

We urgently need to find a better way, and "[illegible] Ecology Centers" may offer a beginning. Such an approach avoids the development of one more curriculum, something we have been doing for 50 years without much effect, and it offers science as an active process. Students come to celebrate the beauty, dynamism, interconnectedness of their local environment by studying it, and such study becomes the exciting part of school.

[illegible] is the director of the Teacher Support Program for [illegible] Public Schools in Oregon and a highly acclaimed environmental educator. He is active in many natural resource education programs, both locally and regionally. He was honored in [illegible] as Marine Educator of the Year by the National Marine Educators Association, and was given the Oregon [illegible] Award for Marine Education.

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environmental education in the pacific northwest

Talking Sense About Developing Environmental Understanding

by Milton McClaren
Associate Professor
Faculty of Education
Simon Fraser University
Burnaby, BC

[illegible]

[illegible]

[illegible]

Talking Sense About Developing Environmental Understanding

continued from page [illegible]

[illegible]

> "Apparently, to be an environmentalist is to be placed in a category which includes [illegible], tree huggers, animal rights advocates, vegetarians and [illegible] in any number of radical [illegible] and [illegible] of the [illegible] movement."

[illegible]

[illegible]

[illegible]

> "If Sustainable Development is converted into an ideology rather than remaining an idea in the process of development, a unifying set of principles, then it will be intellectually fossilised, as [illegible] happened to conceptual studies."

[illegible]

Talking Sense About Developing Environmental Understanding

[illegible]

References

[illegible]

THE ECOLOGICAL CLASSROOM

A supplement to CLEARING: Environmental Education in the Pacific Northwest

ENVIRONMENTAL

HEROES AND HEROINES

An Instructional Unit in Earth Values and Ethics

[illegible]

[illegible]

[illegible]

[illegible]

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THE ECOLOGICAL CLASSROOM

[illegible]

[illegible]

LESSON 1: WHAT DID THEY BELIEVE AND DO?

Investigating Heroes and Heroines

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

LESSON 3: WHAT DID THEY SAY? Quotations About Heroes and Heroines

[illegible]

[illegible]

THE ECOLOGICAL CLASSROOM

[illegible]

Can you name one physical deed and one spiritual deed or message you would give to others about the environment?

> 13. **"All around the world, the efforts to stop the destruction of the environment have come mainly from people who recognize the damage being done in that part of the world in which they themselves have 'dominion.'"** — Al Gore, *Earth in the Balance*

Can you name one person in your community who has done something to improve the local environment? Explain.

> 14. **"...Men and women who care must be politically empowered to demand and help effect remedies to ecological problems wherever they live."** — Al Gore, *Earth in the Balance*

How can you encourage our governmental officials to do something to improve the environment?

> 15. **"If a child is to keep alive his (or her) inborn sense of wonder without any such gift from the fairies, he (or she) needs the companionship of at least one adult who can share it, rediscovering with him (or her) the joy, excitement and mystery of the world we live in."** — Rachel Carson, *The Sense of Wonder*

What adult has helped you to discover the joy, excitement and mystery of the world you live in? Would you consider this person a hero or heroine? Explain.

MATERIALS
Lists of quotations and questions, blank paper, and something to write with.

PROCEDURE
Ask the students to read the quotations and respond to the corresponding question. Discuss the responses in small or large groups. Then ask the students to create their own quotations about environmental heroes and heroines and share them with others.

EXTENSIONS
1. Find more written or spoken quotations that related to environmental heroes and heroines and share them with others.
2. Compile the student-written quotations about the environment and produce a book to share with the community.
3. From the investigations done in Lesson 1, choose a quote by a selected hero or heroine and make a poster including the quote and an illustration created with paint, chalk, a collage of pictures cut from magazines, etc.

EVALUATION
Select an environmental hero or heroine and write an original quotation saying something that you imagine that person would say or that you would like them to say.

LESSON 3:
WHAT DO I BELIEVE AND WHAT CAN I DO?
What Environmental Values Do I Hold?

OBJECTIVES
1. To examine various environmental values positions and decide which ones are personally more important.
2. To identify people who have developed and promoted some of these environmental values.

METHOD
Students respond to and discuss several questions which encourage the expression of their environmental values and learn about people who share some of these views.

BACKGROUND
All environmentalists do not hold the same values about human and non-human nature. There is a wide range of beliefs among those who are working to "save" the earth and its inhabitants. In fact, some environmentalists are even critical of others because they disagree with their goals and/or methods. Each one of the major viewpoints listed in the lesson are more complex than can be stated briefly and therefore, selected references are provided for further reading. (See especially, Joseph R. DesJardins, Environmental Ethics, Belmont, CA: Wadsworth Publishing Company, 1993).
The positions are:
1. **Animal Welfare**
2. **Reverence for Life**
3. **The Land Ethic**
4. **Deep Ecology**
5. **Social Ecology and Ecofeminism**
6. **Radical Ecoactivism**
7. **Wise Use and Management**
8. **Indigenous or "First" Peoples**

1. All "**Animal Welfare**" positions are not alike, but generally they honor individual animals and value them for various reasons. Most animal welfare advocates are critical of raising animals for food and furs, keeping them in zoos, having some pets, using them for scientific research, and hunting and trapping them for sport or sale. Many of these people would therefore suggest that we become vegetarians for moral reasons, however they usually do not extend moral rights to all living things such as bacteria, viruses, ticks and mosquitoes. For further reading see: Peter Singer's *Animal Liberation* 2nd Edition. New York Review of Books, 1990, and Tom Regan's *The Case for Animal Rights*. Berkeley, CA: University of California Press, 1983.

2. The person who developed and promoted the **"Reverence for Life"** position was Albert Schweitzer. He described this view as an attitude of awe and wonder towards all of nature. He believed that it was good to preserve and promote life and evil to destroy and injure life. He believed that all living things had inherent worth, apart from how humans benefited from them. Schweitzer wouldn't kill mosquitoes or use DDT because of its effects on all life, although he did kill his own pelican when he learned that its injuries were untreatable. He didn't believe that some forms of life were better than others. The "Reverence for Life" value position did not answer all the questions about how a person should behave, but it provided a general guideline for living the good life.

For further reading see: James Brabazon's *Albert Schweitzer: A Biography*, New York: Putnam, 1975; Albert Schweitzer's *Out of My Life and Thought*, New York: The New American Library, 1953; and Ann Cottrell Free's *Animals, Nature and Albert Schweitzer* (1982) — available from each of the publishers, the Albert Schweitzer Fellowship, The Animal Welfare Institute, The Albert Schweitzer Center or the Humane Society of the United States.

3. **"The Land Ethic"** value position was originally developed by Aldo Leopold. This view depends upon an understanding of the science of ecology and the relationships among the parts of ecosystems. It also incorporates the belief that human beings are just one part of a larger earth community of plants, animals, soils, water, collectively called "the land." Living things are viewed from the perspective of populations rather than individual animals and plants. Leopold wrote about the land as being a living thing and about maintaining it in good health. He believed that responsible actions would result if a person loved and respected the land. For further reading, see: Aldo Leopold's *A Sand County Almanac*, New York: Oxford University Press, 1949 and Curt Meine's *Aldo Leopold: His Life and Work*, Madison WI: The University Wisconsin Press, 1987

4. The **"Deep Ecology"** value position deals with the deep, underlying causes of pollution and resource depletion. Arne Naess and other proponents of this approach believe that society must make radical changes and that individuals must adopt a new world view or philosophy. The deep ecology movement is based on eight principles, including ideas such as the inherent value of non-human life forms, the decrease of human population, and the need for policy change in the use of resources. The science of ecology is valued, but not as the only set of guiding concepts.

For further reading see: Bill Devall's *Simple in Means, Rich in Ends*, Layton, Utah: Gibbs Smith Publishing, 1988 and Bill Devall and George Sessions' *Deep Ecology: Living as if Nature Mattered*. Salt Lake City: Peregrine Smith Books, 1985.

5. Although **"Social Ecology and Ecofeminism"** differ to some degree, they are alike in some important ways. Murray Bookchin has written about social ecology; a number of authors such as Karen Warren, Susan Griffin, Carolyn Merchant, Mary Daly and Ynestra King have contributed to the growing body of ecofeminist literature. Both value positions view ecological destruction as related to social and political attitudes such as control and dominance. They believe that the destruction of nature results from oppressive patterns and social hierarchies such as men over women, the white race over people of color, and moneyed and educated classes over the poor and illiterate. Ecofeminists believe that the oppression of women by men is the most destructive form of social dominance and that this has a direct relationship to the attempted control of nature.

For further reading see: Murray Bookchin's *The Philosophy of Social Ecology*, Montreal: Black Rose Books, 1990; the American Philosophical Association's *Newsletter on Feminism and Philosophy* 90, No. 3 (Fall, 1991); and *Healing the Wounds: The Promise of Ecofeminism*, edited by Judith Plant, Santa Cruz, CA: New Society Publishers (1989).

6. The **"Radical Environmentalism"** value position could be considered to be an extreme form of some "Deep Ecology" and "Animal Welfare" views. It includes both legal and illegal ways of dealing with polluters and "destroyers" of nature. Organizations such as Greenpeace usually practice legal acts of civil disobedience such as sailing between whalers and whales. Organizations such as Earth First led by David Foreman and advocates of "monkey wrenching" (destroying or disabling environmentally destructive technology such as bulldozers, logging equipment, or fishing gear) such as Edward Abbey, sometimes take illegal actions to stop what they consider to be threats to the survival of the earth and its ecological systems.

For further reading see: Dave Foreman's *Confessions of an Eco-Warrior*, New York: Harmony Books, 1991 and Edward Abbey's *The Monkey Wrench Gang*, Salt Lake City, Utah: Dream Garden Press, 1985.

7. The **"Wise Use and Management"** position views nature as primarily useful to humans. Plants, animals, and land are sometimes valued if their existence does not conflict with human needs. Nature is protected in places, such as parks and forests, but this is often done because of the potential use of humans rather than because the plants, animals, or habitats deserve protection for their own sakes. Animals are often defined in terms of their human impact, such as pests, vermin, and game. Animals are mainly viewed from the perspective of populations rather than individuals. Populations are monitored and controlled through quotas or bag limits placed on hunters, trappers, and fishers. Habitats are managed for their production of specific game animals rather than for animals which have little direct human use. Humans are viewed as separate from other animals and therefore, responsible as stewards of nature. Some leading proponents of management approaches are Frederick Law Olmsted, Gifford Pinchot and Theodore Roosevelt. For further reading see Douglas Strong's *The Conservationists*. Menlo Park CA: Addison Wesley Publishing Company 1971

8. **"Indigenous or 'First' Peoples"** such as Native Americans in what eventually became the United States, view nature as sacred. They believe that all forms of living and non-living things are connected and therefore, humans belong to the same society as other animals, rocks, rivers, and plants. All of nature, including the planet earth, deserves respect and gratitude in the form of prayer, rituals and ceremonies. Land exists to support life and is not to be misused or restricted through ownership by individuals. Humans are seen to have a great deal of responsibility for maintaining the balance and harmony that exists on earth. For further reading see: Suzuki & Knudtson's *Wisdom of the Elders: Honoring Sacred Native Visions of Nature*, New York: Bantam Books, 1992; Chief Dan George & Hirnschall's *My Spirit Soars*, Blaine, WA: Hancock House Publishers, 1989; and Susan Jeffers' *Brother Eagle, Sister Sky: A Message from Chief Seattle*, New York: Dial Books, 1991.

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MATERIALS

A sheet of environmental values questions and students' notes on their answers.

PROCEDURE

The teacher can provide a brief description of the eight types of environmental value positions described in the background section of this lesson. At this point, the names of those who are associated with each position are not important for students to memorize. Students should be given the following list of questions and asked to think and write on each one.

Then, each question can be discussed in small groups or as a whole class. The purpose of the discussions is not to have the students criticize others' responses or to try to change their positions, but to listen carefully to the different responses and to try to understand the state reasons for holding these views.

Following this exercise, have the students identify different people who hold one or more of these positions.

ENVIRONMENTAL VALUES QUESTIONS

Directions: Read each question and write your answer. Think about your reasons for responding the way that you did to each question.

1. Do you think it is right to raise animals for their fur and leather and then make coats, gloves, shoes and other wearing apparel? Do you wear anything made from animals? If so, what? Would it make any difference if the wearing apparel were obtained from a wild animal that was shot or trapped for that purpose?
2. Have you ever thought about being a vegetarian? What are the disadvantages and advantages of becoming one? If eating meat is not a good thing, why is eating plants any different?
3. Do you have a pet? Why might some environmentalists think that you shouldn't have one? Are some pets right to keep and others not right?
4. Have you enjoyed going to the zoo or circus? Have you ever thought about how the animals were treated in each place? Do you agree with some environmentalists that zoos and circuses mistreat some animals?
5. Do you agree with Albert Schweitzer that it's wrong to kill a mosquito even if it is biting you? Are some animals considered pests and others useful to humans? Is it right to kill some animals and protect others because of how they harm or help humans?
6. Some kinds of living things such as bacteria and viruses causes human diseases. Should these harmful organisms be eliminated from the earth if it were possible?
7. Is it right to use some pesticides on crops to get higher yields, even though they kill some insects and other organisms and the pesticides could get into the ground water that humans depend upon for drinking?
8. Is it right to shoot or trap some animals if their populations in the area are large enough to assure that they will reproduce young next year?
9. Is it a good idea for government to control when animals are hunted or trapped and how many should be killed by each hunter or trapper? How many should be killed by each hunter or trapper? Is it ever right to kill females and young from a certain animal species if there are too many of them in that habitat?
10. What conveniences or luxuries would you be willing to give up to make less impact on natural systems? Would it matter if you were the only one giving them up?
11. Do you think it is right to try to control nature by using different forms of technology such as irrigating dry land, seeding clouds to produce rain, or making fresh water from salt water? Does it matter how much these actions add to pollution or the cost of the final product?
12. Is it ever right to break a law in taking action to protect the environment? Give examples to support your position.
13. How would we treat the earth if we really believed that all living and non-living beings had spirits and were to be honored? What specific laws or policies would be created? What would you do differently?
14. Should a specific animal or plant be preserved even if it proved to be of no value for human survival? Explain.
15. Which values position(s) do you believe the government in your community most closely represents. Give specific examples of why you believe as you do.

EXTENSIONS

1. Read about some of the people discussed in this lesson who you admire for their beliefs and/or actions.
2. Make up your own list of environmental values questions and share them with others in the class.
3. Make up a questionnaire on a specific environmental problem or issue and take a survey in the community. Classify the responses according to the eight positions discussed in this lesson. What patterns emerge? Why would one position be more dominant than others? Did you discover some people who hold similar values to yours? Did you discover any patterns to the responses according to gender, age, ethnic origin, or anything else? Did you find any new heroes or heroines?
4. Using the chart created in the evaluation section of Lesson 1, classify each hero or heroine according to the position their values or actions reflect. Note: In some cases more than one position may be reflected. Is there any pattern to the combinations?
5. Which values position(s) do you think the elders in your family hold? Talk to them and try to determine how their views developed and how they are reflected in their behaviors, i.e., who they vote for, what they do for recreation, what they eat, how they manage the materials possessions that they have. How have their values positions affected you?

EVALUATION

1. Write a paragraph describing the environmental value position which comes closest to your philosophy. Give examples from your life.
2. Who might become your hero and heroine from this value position? State three qualities or actions of the person that you admire.

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ENVIRONMENTAL HEROES AND HEROINES

People to investigate for their views on caring for the earth.

1. Abbey, Edward
2. Adler, Margo
3. Agassiz, Jean Lois
4. Andrews, Roy Chapman
5. Audubon, John James
6. Austin, Mary
7. Bailey, Libery Hyde
8. Baker, Richard St. Barbe
9. Bartram, John and William
10. Baylor, Byrd
11. Beard Daniel B.
12. Bennett, Hugh Hammond
13. Berg, Peter
14. Bigelow, Maurice A.
15. Blanchan, Neltje
16. Bookchin, Murray
17. Boyden, Arthur
18. Brower, David
19. Burbank, Luther
20. Burgess, Thornton
21. Burroughs, John
22. Carrighar, Sally
23. Carson, Rachel
24. Carver, George Washington
25. Cather, Willa
26. Chapman, Frank
27. Commoner, Barry
28. Comstock, Anna Botsford
29. Cousteau, Jacques-Yves
30. Daly, Mary
31. Darling, Jay Norward (Ding)
32. Darwin, Charles
33. de Chardin, Teilhard
34. Deloria, Vine, Jr.
35. Douglas, Marjory Stoneman
36. Dubos, Rene Jules
37. Ehrlich, Paul
38. Eifert, Virginia
39. Eiseley, Loren
40. Elk, Black
41. Emerson, Ralph Waldo
42. Fabre, Jean Henri
43. Fazal, Anwar
44. Foreman, Dave
45. Fuller, Buckminster
46. Fuller, Margaret
47. Galdikas, Birute
48. George, Chief Dan
49. Gibbs, Lois
50. Gnau, "Harrison"
51. Goodall, Jane
52. Gordon, Eva L.
53. Gray, Elizabeth Dodson
54. Griffin, Susan
55. Gyatso, Tenzin
56. Hardin, Garrett
57. Harris, Dale
58. Harris William T.
59. Hays, John
60. Hodge, Clifton F.
61. Howard, Sir Albert
62. Jackman, Wilbur S.
63. Kelly, Petra
64. King, Thomas Starr
65. King, Ynestra
66. Krutch, Joseph Wood
67. LaBastille, Anne
68. LaChapelle, Dolores
69. Larson, Gary
70. Leopold, Aldo
71. Linnaeus, Carl
72. London, Jack
73. Long, William J.
74. Lopez, Barry
75. Marcum, Cathy Sneed
76. Marsh, George Perkins
77. Marshall, Bob
78. Mason, Bill
79. Mather, Stephen T.
80. McCloskey, Alice
81. McGaa, Ed (Eagle Man)
82. McHarg, Ian
83. Mendes, Chico
84. Merchant, Carolyn
85. Mikulski, Barbara
86. Mills, Enos A.
87. Miner, Jack
88. Momaday, N. Scott
89. Muir, John
90. Murie, Margaret
91. Murie, Olaus
92. Naess, Arne
93. Nash, Roderick
94. Nelson, Gaylord
95. Olmsted, Frederick Law
96. Olson, Sigurd
97. Osborn, Fairfield
98. Palmer, E. Lawrence
99. Payne, Frank O.
100. Petzoldt, Paul
101. Pinchot, Gifford
102. Powell, John Wesley
103. Rich, Louise Dickinson
104. Roberts, Charles G.D.
105. Rodale, Jerome Irving
106. Roosevelt, Franklin D.
107. Roosevelt, Theodore
108. Roszak, Theodore
109. Russell, Helen Ross
110. Schumacher, E.F.
111. Scott, Charles
112. Seattle, Chief
113. Seton, Ernest Thompson
114. Sharp, Dallas Lore
115. Sheldon, Edward A.
116. Snyder, Gary
117. Spencer, John W.
118. Standing Bear, Luther
119. Storm, Hyemeyohsts
120. Straight, H.H.
121. Suzuki, David
122. Teale, Edwin Way
123. Thoreau, Henry David
124. Udall, Stewart
125. Unsoeld, Jolene
126. Van Hise, charles
127. Vinal, William
128. Vogt, William
129. von Humboldt, Alexander
130. Wallace, Alfred Russel
131. Walton, Izaak
132. Ward (Jackson), Barbara
133. Warren, Karen
134. Watts, May Theilgaard
135. Wenkhe, Michael
136. White, Gilbert
137. Whitman, Walt
138. Wilson, Edward O.
139. Wright, Mabel Osgood
140. Zahniser, Howard

WHO WILL BE THE ENVIRONMENTAL HEROES AND HEROINES OF THE FUTURE?

If you would like a free bibliography of reference books to support this instructional unit, write to CLEARING Magazine, PO Box 5176, Oregon City OR 97045.

This unit was developed with funds provided by the Illinois State Board of Education Scientific Literacy Grant to the Environmental Education Association of Illinois. Dr. Knapp would like to hear from teachers who use this instructional unit for suggestions on additions or improvements. He can be reached at Northern Illinois University's Lorado Taft Field Campus, Box 313, Oregon, Illinois 61061 or by phone at (815) 732-2111.

CLEARING
environmental education in the pacific northwest

What is Education For?

If humans are to flourish on this planet, education, whose dominant focus has been human culture, must clearly place that culture within the larger context of nature. The myths that drive modern education must be replaced by a new set of principles.

by David W. Orr

If today is a typical day on planet Earth, we will lose 116 square miles of rainforest or about an acre a second. We will lose another 72 square miles to encroaching deserts, the results of human mismanagement and overpopulation. We will lose 40-100 species, and no one knows whether the number is 40 or 100. Today the human population will increase by 250,000. And today we will add 2,700 tons of chlorofluorocarbons to the atmosphere and 15 million tons of carbon. Tonight the Earth will be a little hotter, its waters more acidic, and the fabric of life more threadbare. By year's end the numbers are staggering: the total loss of rainforest will equal an area the size of the state of Washington; expanding deserts will equal an area the size of the state of West Virginia; and the global population will have risen by more than 90,000,000. By the year 2000 perhaps as many as 20% of the life forms on the planet in the year 1900 will be extinct.

The truth is that many things on which our future health and prosperity depend are in dire jeopardy: climate stability, the resilience and productivity of natural systems, the beauty of the natural world, and biological diversity.

It is worth noting that this is not the work of ignorant people. It is rather largely the results of work by people with B.A.s, B.S.s, M.B.A.s and Ph.D.s. Elie Wiesel recently made the same point in a speech to the Global Forum in Moscow, saying that the designers and perpetrators of Auschwitz, Dachau, and Buchenwald were the heirs of Kant and Goethe. In most respects the Germans were the best educated people on Earth, but their education did not serve as an adequate barrier to barbarity. What was wrong with their education? In Wiesel's words:

> *It emphasized theories instead of values, concepts rather than human beings, abstraction rather than consciousness, answers instead of questions, ideology and efficiency rather than conscience.*

I believe that the same could be said for our education. Toward the natural world it too emphasizes theories, not values, abstraction rather than consciousness, neat answers instead of questions, and technical efficiency over conscience. It is a matter of no small consequence that the only people who have lived sustainably on the planet for any length of time could not read, or like the Amish do not make a fetish of reading. My point is simply that education is no guarantee of decency, prudence, or

What is Education For?

(continued from page 7)

wisdom. This is not an argument for ignorance, but rather a statement that the world of education must not be measured against the standards of decency and human survival — the issues now looming so large before us in the decade of the 1990s and beyond. It is not education that will save us, but education of a certain kind.

What went wrong with contemporary culture and with education? We can find insight in literature including Christopher Marlowe's Faust who trades his soul for knowledge and power, Mary Shelley's Dr. Frankenstein who refuses to take responsibility for his creation, and Herman Melville's Captain Ahab who says "All my means are sane, my motive and my object mad." In these characters we encounter the essence of the modern drive to dominate nature.

> *Despite all of our advances in some areas, we still do not have anything like the science of land health that Aldo Leopold called for half a century ago.*

Historically, Francis Bacon's proposed union between knowledge and power foreshadowed the contemporary alliance between government, business, and knowledge that has wrought so much mischief. Galileo's separation of the intellect foreshadowed the dominance of the analytical mind over that part given to creativity, humor, and wholeness. And in Descarte's epistemology one finds the roots of the radical separation of self and object. Together these three laid the foundations for modern education, foundations that now are enshrined in myths that we have come to accept without question. Let me suggest six.

First there is the myth that ignorance is a solvable problem. Ignorance is not a solvable problem; it is rather an inescapable part of the human condition. We cannot comprehend the world in its entirety. The advance of knowledge always carries with it the advance of some form of ignorance. For example, in 1929 ignorance of what chlorofluorocarbons would do to the stratospheric ozone and climate stability was of no importance, since they had not been invented. But after Thomas Midgley, Jr. discovered CFCs in 1930, what had been trivial ignorance became a life-threatening gap in human understanding of the biosphere. Not until the early 1970s did anyone think to ask "what does this substance do to what?" In 1986 we discovered that CFCs had created a hole in the ozone over the South Pole the size of the lower 48 states, and by 1990 a serious general thinning of ozone worldwide. With the discovery of CFCs, knowledge increased, but like the circumference of an expanding circle, ignorance grew as well.

A second myth is that, with enough knowledge and technology, we can manage planet Earth. Higher education has been largely shaped by the drive to extend human domination to its fullest. In this mission human intelligence may have taken the wrong road. Nonetheless, managing the planet has a nice ring to it. It appeals to our fascination with digital readouts, computers, buttons, and dials. But the complexity of Earth and its life systems can never be safely managed. The ecology of the top inch of topsoil is still largely unknown, as is its relationship to the large systems of the biosphere. What might be managed, however, is us: human desires, economies, politics, and communities. But our attention is caught by those things that avoid the hard choices implied by politics, morality, ethics, and common sense. It makes far better sense to reshape ourselves to fit a finite planet than to attempt to reshape the planet to fit our infinite wants.

A third myth is that knowledge is increasing and, by implication, so is human goodness. There is an information explosion going on, by which I mean a rapid increase in data, words, and paper. But this explosion should not be mistaken for an increase in knowledge and wisdom, which cannot be measured so easily. What can be said truthfully is that some knowledge is increasing, while other kinds of knowledge is being lost. For example, David Ehrenfeld has pointed out that biology departments no longer hire faculty in such areas as systematics, taxonomy, or ornithology. In other words, important knowledge is being lost because of the recent overemphasis on molecular biology and genetic engineering, which are more lucrative but not more important areas of inquiry. Despite all of our advances in some areas, we still do not have anything like the science of land health that Aldo Leopold called for half a century ago.

It is not just knowledge in certain areas that we're losing, but vernacular knowledge as well, by which I mean the knowledge that people have of their places. In Barry Lopez's words:

> *It is the chilling nature of modern society to find an ignorance of geography, local or national, as excusable as an ignorance of hand tools, and to find the commitment of people to their home places only momentarily entertaining, and finally naive...*
>
> *[I am] forced to the realization that something strange, if not dangerous, is afoot. Year by year the number of people with firsthand experience in the land dwindles. Rural populations continue to shift to the cities... In the wake of this loss of personal and local knowledge, the knowledge from which a real geography is derived, the knowledge on which a country must ultimately stand, has come something hard to define but I think sinister and unsettling.*

The modern university does not consider this kind of knowledge worth knowing except to record it as an oddity, "folk culture." Instead it conceived its mission as that of adding to what is called the "fund of human knowledge" through research. And what can be said of research? Historian Page Smith offers one answer:

> *The vast majority of so-called research turned out in the modern university is essentially worthless... it does not in the main result in greater health or happiness among the general populace or any particular segment of it. It is busywork on a vast, almost incomprehensible scale. It is dispiriting; it depresses the whole scholarly enterprise; and most important of all, it deprives the student of what he or she deserves — the thoughtful and consid-*

erate attention of a teacher deeply and unequivocally committed to teaching.

In the confusion of data with knowledge is a deeper mistake that learning will make us better people. But learning, as Loren Eiseley once said, "is endless and in itself it will never make us ethical men." Ultimately, it may be the knowledge of the good that is most threatened by all of our other advances. All things considered, it is possible that we are becoming more ignorant of the things we must know to live well and sustainably on the Earth.

In thinking about the kinds of knowledge and the kinds of research that we will need to build a sustainable society, there is a distinction to be made between intelligence and cleverness. Intelligence is long term and aims toward wholeness. Cleverness is mostly short term and tends to break reality into bits and pieces.

Cleverness is personified by the functionally rational technician armed with know-how and methods, but without a clue about the higher ends to which technique should be subservient. The goal of education should be to connect intelligence, with its emphasis on whole systems and the long term, with cleverness, which is being smart about details.

A fourth myth of higher education is that we can adequately restore that which we have dismantled. I am referring to the modern curriculum. We have fragmented the world into bits and pieces called disciplines and subdisciplines, hermetically sealed from other such disciplines. As a result, after 12 or 16 or 20 years of education, most students graduate without any broad, integrated sense of the unity of things. The consequences for their personhood and for the planet are large. For example, we routinely produce economists who lack the most rudimentary knowledge of ecology. This explains why our national accounting systems do not subtract the costs of biotic impoverishment, soil erosion, and poisons in our air and water from gross national product. We add the price of the sale of a bushel of wheat to GNP while forgetting to subtract the three bushels of topsoil lost in its production. As a result of incomplete education, we've fooled ourselves into thinking that we are much richer than we are. The same point could be made about other disciplines that have become hermetically sealed.

Fifth, there is a myth that the purpose of education is that of giving you the means for upward mobility and success. Thomas Merton once identified this as the "mass production of people literally unfit for anything except to take part in an elaborate and completely artificial charade." When asked to write about his own success, Merton responded by saying that "if it so happened that I had once written a bestseller, this was a pure accident, due to inattention and naivete, and I would take very good care never to do the same again." His advice to students was to "be anything you like, be madmen, drunks, and bastards of very shape and form, but at all costs avoid one thing: success." The plain fact is that the planet does not need more successful people. But it does desperately need more peacemakers, healers, restorers, storytellers, and lovers of every shape and form. It needs people who live well in their places. It needs people of moral courage willing to join the fight to make the world habitable and humane. And these have little to do with success as our culture has defined it.

Finally, there is a myth that our culture represents the pinnacle of human achievement. This myth represents cultural arrogance of the worst sort, and a gross misreading of history and anthropology. Recently this view has taken the form that we won the cold war. Communism failed because it produced too little at too high a cost. But capitalism has also failed because it produces too much, shares too little, also at too high a cost to our children and grandchildren. Communism failed as an ascetic morality. Capitalism has failed because it destroys morality altogether. This is not the happy world that any number of advertisers and politicians describe. We have built a world of sybaritic wealth for a few and Calcuttan poverty for a growing underclass. At its worst it is a world of crack on the streets, insensate violence, and the most desperate kind of poverty. The fact is that we live in a disintegrating culture. In the words of Ron Miller, editor of Holistic Review:

> *Our culture does not nourish that which is best or noblest in the human spirit. It does not cultivate vision, imagination, or aesthetic or spiritual sensitivity. It does not encourage gentleness, generosity, caring, or compassion. Increasingly in the late twentieth century, the economic-technocratic-statist world view has become a monstrous destroyer of what is loving and life-affirming in the human soul.*

Measured against the agenda of human survival, how might we rethink education? Let me suggest six principles.

First, all education is environmental education. By what is included or excluded we teach students that they are part of or apart from the natural world. To teach economics, for example, without reference to the laws of thermodynamics or those of ecology is to teach a fundamentally important ecological lesson: that physics and ecology have nothing to do with the economy. It just happens to be dead wrong. The same is true throughout all of the curriculum.

All things considered, it is possible that we are becoming more ignorant of the things we must know to live well and sustainably on the Earth.

A second principle comes from the Greek concept of Paideia: The goal of education is not a mastery of subject matter, but mastery of one's person. Subject matter is simply the tool. Much as one would use a hammer and chisel to carve a block of marble, one uses ideas and knowledge to forge one's own personhood. For the most part we labor under a confusion of ends and means, thinking that the goal of education is to stuff all kind of facts, techniques, methods, and information into the student's mind, regardless of how and with what effect it will be

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(continued from page 9)

used. The Greeks knew better.

Third, I would like to propose that knowledge carries with it the responsibility to see that it is well used in the world. The results of a great deal of contemporary research bear resemblance to those foreshadowed by Mary Shelley: monsters of technology and its byproducts for which no one takes responsibility or is even expected to take responsibility. Whose responsibility is Love Canal? Chernobyl? Ozone depletion? The Valdez oil spill? Each of these tragedies was possible because of knowledge created for which no one was ultimately responsible. This may finally come to be seen for what I think it is: a problem of scale. Knowledge of how to do vast and risky things has far outrun our ability to responsibly use it. Some of it cannot be used responsibly, which is to say safely and to consistently good purposes.

Fourth, we cannot say that we know something until we understand the effects of this knowledge on real people and their communities. I grew up near Youngstown, Ohio, which was largely destroyed by corporate decisions to "disinvest" in the economy of the region. In this case M.B.A.s, educated in the tools of leveraged buyouts, tax breaks, and capital mobility have done what no invading army could do — they destroyed an American city with total impunity on behalf of something called the "bottom line." But the bottom line for society includes other costs, those of unemployment, crime, alcoholism, child abuse, lost savings, and wrecked lives. In this instance what was taught in the business schools and economics departments did not include the value of good communities, or the human costs of a narrow destructive economic rationality that valued efficiency and economic abstractions above people and community.

My fifth principle has to do with the power of example over words. Students hear about global responsibility while being educated in institutions that often spend their budgets and invest their endowments in the most irresponsible things. The lessons being taught are those of hypocrisy and ultimately despair. Students learn, without anyone ever saying it, that they are helpless to overcome the frightening gap between ideals and reality. What is desperately needed are faculty and administrators who provide role models of integrity, care, thoughtfulness, and institutions capable of embodying ideals wholly and completely in all of their operations.

Finally, I would like to propose that the way learning occurs is as important as the content of particular courses. Process is important for learning. Courses taught as lecture courses tend to induce passivity. Indoor classes create the illusion that learning only occurs inside four walls isolated from what students call, without apparent irony, the "real world." Dissecting frogs in biology classes teaches lessons about nature that no one would verbally profess. Campus architecture is crystallized pedagogy that often reinforces passivity, monologue, domination, and artificiality. My point is simply that students are being taught in various and subtle ways beyond the content of courses (the tacit curriculum).

If education is to be measured against the standard of sustainability, what can be done? I would like to propose four things. **First, I would like to propose a dialogue in every educational institutional about the substance and process of education.** Are graduates better planetary citizens or are they, in Wendell Berry's words, "itinerant professional vandals?" Does the institution contribute to the development of sustainable regional economy or, in the name of efficiency, to the processes of destruction?

My second suggestion is to use campus resource flows (food, energy, water, materials, and waste) as part of curriculum. Faculty and students together might study the wells, mines, farms, feedlots, and forests that supply the campus, as well as the dumps, smokestacks, and outfall pipes at the other end. The purpose is both pedagogic, using real things to teach stewardship, and practical, to change the way the particular institution spends its operational budget. One result would be to engage the creative energy of students in finding ways to shift the institutional buying power to support better alternatives that do less environmental damage, lower CO_2 emissions, reduce use of toxic substances, promote energy efficiency and the use of solar energy, help to build a sustainable regional economy, cut long-term costs, and provide an example to other institutions. The results of these studies should be woven into the curriculum as interdisciplinary courses, seminars, lectures, and research.

My third suggestion is to examine institutional investments. Is the endowment invested according to the Valdez Principles? Is it invested in companies doing things that the world needs done and in a responsible manner? Can some part of it be invested locally to help leverage energy efficiency and the evolution of a sustainable economy in the surrounding region? The research necessary to answer such questions might also form the basis of courses that focus on the development of sustainable local and regional economies.

Finally, every educational institution should set a goal of ecological literacy for all of its students. No student should graduate from any educational institution without a basic comprehension of:

1. the laws of thermodynamics
2. the basic principles of ecology
3. carrying capacity
4. energetics
5. least-cost, end-use analysis
6. how to live well in a place
7. limits of technology
8. appropriate scale
9. sustainable agriculture and forestry
10. steady-state economics
11. environmental philosophy and ethics.

Collectively these imply the capacity to distinguish between health and disease, development and growth, sufficient and efficient, optimum and maximum, and "should do" from "can do."

As Aldo Leopold asked in a similar context: "If education does not teach us these things, then what is education for?"

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